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AIR POLLUTION ABSTRACTS

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CONTENTS

	Page
Introduction	3
APTIC Publications	5
Subject Fields and Scope Notes	7
Abstract Bulletin	9
Subject Index	SI-1
The terms that most closely describe the information presented in the documents are arranged alphabetically.	
Author Index	AI-1
Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.	

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

- Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts*, June 1973, GPO No. EP 4.9:126, \$0.65.
- Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts*, June 1973 GPO No. EP 4.9:125, \$0.70.
- Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts*, March 1973, GPO No. EP 4.9:121, \$2.35.
- Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts*, June 1973, GPO No. EP 4.9:119, \$0.90.
- Mercury and Air Pollution: A Bibliography with Abstracts*, October 1972, GPO No. EP 4.9:114, \$1.25.
- Odors and Air Pollution: A Bibliography with Abstracts*, October 1972, GPO No. EP 4.9:113, \$3.00.
- Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts*, July 1972, GPO No. EP 4.9:110, \$1.25.
- Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts*, May 1972, GPO No. EP 4.9:107, \$1.00.
- Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts*, May 1972, GPO No. EP 4.9:105, \$2.00.
- Hydrochloric Acid and Air Pollution: An Annotated Bibliography*, July 1971, GPO No. EP 4.9:100, \$0.55.
- Chlorine and Air Pollution: An Annotated Bibliography*, July 1971, GPO No. EP 4.9:99, \$0.55.
- Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:96, \$2.25.
- Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:95, \$0.50.
- Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:94, \$0.65.
- Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:93, \$0.45.
- Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:92, \$1.00.
- Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes)*, March 1971, GPO No. EP 4.9:88, \$6.25.
- Beryllium and Air Pollution: An Annotated Bibliography*, February 1971, GPO No. EP 4.9:83, \$0.40.
- Asbestos and Air Pollution: An Annotated Bibliography*, February 1971, GPO No. EP 4.9:82, \$0.50.
- Municipal Incineration: A Review of Literature*, June 1971, GPO No. EP 4.9:79, \$1.00.
- Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes)*, October 1970, GPO No. HE 20.1309:75, \$5.00.

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SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere. Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

CONTROL METHODS

1976

58101

APTIC NO. 84251

Alef, G.

RECOMMENDATION FOR A REMOTE HEAT SUPPLY SYSTEM. (Vorschlag fuer ein Fernwaermeversorgungssystem). Text in German. Brennstoff-Waerme-Kraft, 28(1):12-18, 1976. 9 refs.

A long-distance heat supply system for the utilization of waste heat from power stations for households and industry was suggested. At the power station, heat was stored by evaporation of ammonia from salts or salt-containing fluids. Both substances were then transported by rail or water to a heating center close to the consumer where the heat was recovered by the mutual reaction of both components. The reaction product was subsequently returned to the power station and reactivated by a new heat supply. The heat storage consisted of 2 vessels, 1 tank with liquid ammonia and 1 tank for ammoniates. A cost estimate showed that heat transported by train or boat up to a distance of 100 km, could be offered at a lower price than for fuel oil heat. This system was not only ecologically beneficial, but reduced pollution at both ends. The heating cost from power station or reactor would run to \$1.70/Gcal, investment plus interest \$4.00/Gcal, transportation (\$1.70/ton/100 km) \$7.00/Gcal or a total of \$13.00/Gcal by rail and even less by boat.

58102

APTIC NO. 80548

Ananth, K. P. and L. J. Shannon

EVALUATION OF ELECTROFLUIDIZED BED (FINAL REPORT). Midwest Research Inst., Kansas City, Mo., Environmental Protection Agency Contract 68-02-1324, Task 13, Program Element 1AB012; ROAP/21ADL-029, Rept. EPA-600/2-76-040, 29p., Feb. 1976. 14 refs.

The concept of using an electrofluidized bed for the collection of fine particulates was analyzed and evaluated. A simple model was developed to describe the interaction between an aerosol stream and the bed material. Overall collection efficiency of the device was theoretically predicted from single target efficiency values based on electrostatic and inertial forces. Maximum predicted overall collection efficiencies ranged from 96% for a 1 micron aerosol particle to 85% for a 0.5 micron aerosol particle with collector bodies of size 100 micron, an availability factor of 0.1, and fluidization velocities of 0.5 ft/sec. An increase in fluidization velocity or a decrease in collector number density diminished the overall collection efficiency under the conditions studied. The performance of the electrofluidized bed depends upon the interaction of the electrostatic forces and bed dynamics. The inherent instability of solids flow patterns in gas-fluidized beds may limit the collection efficiency that can be achieved. (Author abstract modified)

58103

APTIC NO. 81902

Ananth, K. P. and L. J. Shannon

EVALUATION OF TURBULENT AGGLOMERATION FOR FINE PARTICLE CONTROL (FINAL REPORT). Midwest Research Inst., Kansas City, Mo., Environmental

Protection Agency Contract 68-02-1324, Program Element 1AB012, ROAP 21ADL-029, Task 26, Rept. EPA-600/2-76-066, 13p., March 1976. 10 refs.

Theoretical and experimental studies of the potential of turbulent agglomeration for enhancing fine particulate control are reviewed. The influence of turbulence on particle agglomeration appears to be strongly dependent on particle size and decreases with decreasing particle size. Turbulence does not significantly enhance the coagulation constants for particles less than 0.2 micron in diameter. It does, however, increase the coagulation constant of 0.5-micron particles by about a factor of 10 and the coagulation constant of 1-micron particles by a factor of 100. In view of the fact that particles in the 0.1-0.5 micron size range are the most difficult to collect by conventional systems, turbulent agglomeration is not very attractive. Moreover, the energy consumption associated with the process is extremely high. (Author conclusions modified)

58104

APTIC NO. 81903

Ananth, K. P. and L. J. Shannon

EVALUATION OF THERMAL AGGLOMERATION FOR FINE PARTICLE CONTROL (FINAL REPORT). Midwest Research Inst., Kansas City, Mo., Environmental Protection Agency Contract 68-02-1324, Program Element 1AB012, ROAP 21ADL-029, Task 26, Rept. EPA-600/2-76-067, 16p., March 1976. 13 refs.

The potential of thermal agglomeration as a means of enhancing fine particle collection is evaluated. An overriding disadvantage of thermal agglomeration is the long residence time required to achieve significant particle growth. Residence times of several minutes or even hours are required for significant agglomeration and particle growth to occur, whereas industrial gas cleaning applications require residence times of 10 sec or less. The successful utilization of factors which promote thermal agglomeration is not likely to reduce residence times to anything near those required for industrial applications. (Author conclusions modified)

58105

APTIC NO. 81093

Anastas, M. Y.

MOLECULAR SIEVE MERCURY CONTROL PROCESS IN CHLOR-ALKALI PLANTS (FINAL REPORT). Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract 68-02-1323, Program Element 1AB014, ROAP 21ADH-008, Task 17, Rept. EPA-600/2-76-014, 72p., Jan. 1976. 32 refs.

The effectiveness of the PuraSiv mercury adsorption process for removing mercury vapors from hydrogen by-product and end-box ventilation streams generated at a mercury cell chlor-alkali plant was investigated. The investigation included the analysis of data obtained from field tests of a system currently in operation and the analysis of technical information provided by the system vendor together with that available in the literature. Although measurements of mercury concentration in the hydrogen by-product stream entering the adsorber unit appeared to be in error, outlet concentration data revealed levels of less than 60 ppb (volume). Operating costs of the process vary between \$0.58 and \$0.33/ton of chlorine produced for plants with capacities between 100 and 750 tons/day. (Author abstract modified)

58106

APTIC NO. 80546

Ando, Jumpei and Gerald A. Isaacs

SO₂ ABATEMENT FOR STATIONARY SOURCES IN JAPAN (FINAL REPORT). PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1321, Task 6, Program Element 1AB013; ROAP/21ACX-130, Rept. EPA-600/2-76-013a, 202p., Jan. 1976. 12 refs.

The status of desulfurization technology in Japan up to January 1975 is described, with emphasis on the recovery of sulfur dioxide in lime/limestone based processes. Information on energy usage, fuel resources, and projected pollutant abatement requirements in Japan is included. The current status of desulfurization technologies, including hydrodesulfurization of oil, decomposition of residual oil, gasification of coal and oil, and flue gas desulfurization (FGD) is discussed. Major Japanese FGD processes are examined in detail. Technical and economic aspects of the systems are discussed, and the processes are evaluated for potential U. S. application. Principal by-products of the various systems are discussed. (Author abstract)

58107

APTIC NO. 80547

Ando, Jumpei, Heichiro Tohata, and Gerald A. Isaacs

NO_x ABATEMENT FOR STATIONARY SOURCES IN JAPAN. PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1321, Task 6, Program Element 1AB014; ROAP 21ACX-130, Rept. EPA-600/2-87-013b, 116p., Jan. 1976. 12 refs.

Regulations for nitrogen oxides abatement in Japan are summarized, techniques for abatement by means of combustion control are described, and current wet and dry processes for denitrification of flue gases are analyzed. The major fuel in Japan is heavy residual oil. Lesser amounts of coal are used. Natural gas usage is insignificant. Six different low-NO_x oil burner designs are discussed. Eleven major NO_x scrubber plants have been completed or are nearing completion. Descriptions of the major NO_x removal processes are included. The chemistry of NO_x liquid reactions is discussed as it applies to the various scrubber processes: advantages and disadvantages of the processes are listed. Current Japanese research and development projects are also discussed. (Author abstract)

58108

APTIC NO. 83553

Apostolescu, N.

EFFECT OF BARIUM ADDITIVE ON THE DIESEL SMOKE. Rev. Roumaine Sci. Tech. Ser. Electrotech. Energet., 21(1):129-138, Jan.-March 1976. 4 refs.

The efficiency of a commercial barium additive on the mass concentration of smoke in the exhaust of a diesel engine was investigated. The smoke in the diesel exhaust consists of solid particles of soot with a graphite structure and the chemical composition of a polybenzenoid. These particles have an average diameter of 1 micron. The formation mechanism is unknown. The soot formation starts almost at the same time as the combustion process and continues with intensities which reflect the local insufficiencies of the oxygen concentration. The Ba additive decreases the total mass of the particles emitted. The efficiency depends on the engine speed and load. The additive is eliminated mostly as barium sulfate, which is not harmful to health. (Author abstract modified)

58109

APTIC NO. 83051

Atherton, L. F. and N. A. Holt

THE ROLE OF COAL GASIFICATION IN THE ELECTRIC POWER INDUSTRY. Preprint, 12p., 1976. (Presented at the Air Pollution and Industrial Hygiene Conference, 12th, Air Quality Management in the Electric Power Industry Conference, Austin, Tex., Jan. 28-30, 1976.)

AIR POLLUTION ABSTRACTS, JUNE 1976

The role of coal gasification in the electric power industry is discussed in terms of requirements of combined cycles, system reliability, and economics. The most likely potential use of coal gasification in the electric power industry is its integration with combined cycle generating systems. Slagging moving bed gasification and two-stage entrained bed gasification appear to be the processes most likely to be used by the power industry in the near and intermediate future. Low and medium Btu two-stage entrained gasifiers and medium Btu slagging moving bed gasifiers integrated with combined cycle generation are no more costly than conventional steam plants with wet limestone scrubbing and probably can offer significant cost savings.

58110

APTIC NO. 83836

Atsukawa, Masumi and Naoharu Shinoda

STACK GAS DESULFURIZATION METHOD PRODUCING LIME SULFITE AS A SECONDARY PRODUCT. (Aryusan sekkai o fukusei suro haen datsuryujoho). Text in Japanese. (Mitsubishi Heavy Industries, Ltd. (Japan)) Japan. Pat. Sho 51-2319. 4p., Jan. 24, 1976. (Appl. May 21, 1972, 1 claim).

An efficient and economical method of recovering lime sulfite from stack gas desulfurization processes which use lime slurry as an absorbent is presented. The lime sulfite recovered from desulfurization is being experimentally used for application as a plastic filler, however, conventionally recovered lime sulfite has small crystallites smaller than 1 micron, and they are neither uniform nor suitable in lime content for such a purpose. The new process uses only one absorption column to remove over 90% of the sulfur oxide in the exhaust gas and holds the coefficient of calcium utilization of the absorbent slurry to a range of 85-95%. In the reaction chamber of the process, the absorbent slurry contacts sulfur dioxide at or over 5% concentration at a pH below 3 and a reaction temperature over 65 C, and is then separated into a solid portion and a liquid portion. Next, the liquid portion is mixed with an absorbent slurry and concentrated in the mixing tank, and recirculated into the reaction chamber. The solid portion is thick and forms highly qualified plate-form lime sulfite crystals of a 1-10 micron size with a low lime content which are suitable for use as a plastic filler.

58111

APTIC NO. 83757

Beedgen, O.

DRAFT REGULATION AT OIL AND GAS-FIRED HEATING SYSTEMS. (Die Zugregelung bei oel- und gasgefeuerten Heizungsanlagen). Text in German. Oel Gasfeuerung, 21(1):29-31, 1976.

Enclosing draft regulators for oil- and gas-fired power plants reduces energy losses because heat convection and radiation at the control apparatus is avoided. Since pressure variations are eliminated, a more uniform combustion is achieved and carbon monoxide in exhaust gases is reduced. A combustion efficiency of 90% or more, using 10% excess air, is usually possible in such plants. The method is illustrated by an arithmetic example in which a 400,000 kcal/hr boiler is equipped with enclosed draft controls. The amount of heating oil saved is 2031 liters/yr compared to the case in which draft controls are not enclosed.

58112

APTIC NO. 84248

Bennert, J.

MODERNIZING OLDER POWER PLANTS WITH THE AID OF GAS TURBINES. (Modernisierung aelterer Kraftwerke mit Hilfe von Gasturbinen). Text in German. VGB Kraftwerkstechnik, 56(1):20-23, 1976.

The problem of making older power stations more economical and reliable by the substitution of available steam generators with gas turbines supplying waste-heat-steam to the old steam turbines was discussed. These gas turbines, equipped with a posteriorly connected waste heat steam generator, represent a remarkable possibility to adjust older steam power stations to

modern levels of efficiency. The result is a plant subject to certain limitations regarding fuel consumption. Gas turbines are presently powered with distillates or natural gas. They offer good heat consumption, adjustable operability, minor losses from station shutdowns, minor maintenance cost due to comprehensive automation, moderate investment capital, little space requirement, low emission, low cooling water requirement. Reconstruction of the power station including the expense for adjustments in the older station would run to about 30 million dollars. In the power station under discussion, the steam produced by 2 steam generators is fed to 3 old gas turbines thereby reaching an efficiency level of 60 MW. The total output of the combination is 210 MW and maximal heat consumption 2150 kcal/Kw/hr. Fuel for the gas turbines was fuel oil and natural gas.

58113

APTIC NO. 84160

Bohn, Thomas and Hans-Guenter Eickhoff

HYDROGEN AS RAW MATERIAL AND ENERGY SOURCE. (*Wasserstoff als Rohstoff und Energiequelle*). Text in German. *Chem. Ing.-Tech.*, 48(2):133-135, 1976. 13 refs.

Hydrogen as an alternative fuel with low pollution is discussed. Considerations of about H₂ production focus on thermolytic cracking of water by means of heat from nuclear processes with a remarkably high yield. Many procedures have been suggested, few have been tested. From the ecological viewpoint, a hydrogen technology would be most beneficial; only water would result from combustion of H₂ with oxygen. Hydrogen could be directly utilized as a fuel and for the generation of heat. It has a higher energy density (28.66 kcal/kg) than other energy carriers (methane, light fuel oil, and coke). Large-scale utilization of hydrogen could only be realized if safety aspects were met. Energy supply in the form of H₂ would require only a slight conversion of combustion chambers from natural gas to hydrogen. For automobiles, 3 experimental types of hydrogen storage were tested: pressure gas tank, hydride storage, and liquid H₂ storage. All are inferior to the gasoline tank with respect to mass and space requirements. They do not presently constitute an alternative to conventional propulsion systems. Hydrogen could be directly used as an energy supply and indirectly by way of enriching fossil energy. If commercially feasible technologies were available by the end of this century, about 10 to the 12th power cubic m of hydrogen would have to be produced if 1/3 of the energy demand was to be covered by H₂.

58114

APTIC NO. 81094

Bornstein, L. J., R. B. Fling, F. D. Hess, R. C. Rossi and J. Rossoff

REUSE OF POWER PLANT DESULFURIZATION WASTE WATER (FINAL REPORT). Aerospace Corp., El Segundo, Calif., Environmental Protection Agency Grant R-802853-01-0, Program Element 1BB392, ROAP R21AZU-025, Rept. EPA-600/2-76-024, 135p., Feb. 1976. 64 refs.

The feasibility and economics of reusing power plant desulfurization waste water are evaluated for four different scrubber liquors. Treatment for service water usage in most cases can be accomplished by chemical precipitation (e.g., lime-soda softening, filtration, and pH control when necessary). This includes usages such as scrubber make-up, cooling tower make-up, and plant housekeeping. Excessive chloride content in the scrubber liquor appears to require additional treatment such as reverse osmosis. Chemical precipitation and reverse osmosis must always be used for the discharge of wastewater to surface waters, resulting in a cost of approximately twice that associated with treatment for service water in most cases. Total treatment costs (capital and operation) for a 1000-megawatt unit range from \$9.00/1000 gal to \$5.00/1000 gal (200 and 700 gpm flow rates, respectively) for lime-soda softening and filtration pretreatment plus reverse osmosis and from \$5.00/1000 gal to \$2.50/1000 gal (200 and 700 gpm flow

rates, respectively) for lime-soda softening and filtration, assuming a 30-year equipment life and an 18% annualized capital charge. (Author conclusions modified)

58115

APTIC NO. 84229

Bratzler, Karl, Alexander Doerges, and J. Schlauer

SULFUR PRODUCTION FROM LOW-HYDROGEN SULFIDE WASTE GASES. (*Schwefelgewinnung aus schwefelwasserstoffarmen Abgasen*). Text in German. *Erdöl Kohle-Erdgas-Petrochem.*, 29(1):19-22, Jan. 1976. 6 refs.

In the LUKAS-Process, tailgases from Claus plants containing sulfur compounds are purified of sulfur dioxide and hydrogen sulfide to below 200 ppm. The process is operated in 3 stages. In the first stage, the Claus tailgas is incinerated with low surplus air. In the second stage, the gas is treated in a coke reactor at 380 C to reduce sulfur trioxide and oxygen which are detrimental to the subsequent SO₂ absorption, and to remove H₂S. The remaining SO₂ is absorbed in the third stage by a circulating alkali phosphate solution in water, which is regenerated by heating. The concentrated SO₂ released returns to the Claus plant or may be catalytically reduced to sulfur. Consumption figures and relative costs of the process are given. The process is also suitable for the treatment of off-gases with low contents in O₂, H₂S, or SO₂, when other processes may not be applicable or too expensive. There is no need to continuously dispose of by-products in solid or liquid form.

58116

APTIC NO. 84228

Broer, Wilhelm T., Pieter Schalke, and Geert de Weert

REDUCTION OF NOX THROUGH APPLICATION OF TWO-STAGE COMBUSTION; STUDIES ON AN INDUSTRIAL WATER TUBE BOILER. (*NOx-Verminderung durch Anwendung der Zweistufenverbrennung. Untersuchungen an einem Industrie-Wasserrohrkessel*). Text in German. *Gas, Wasserfach, Gas/Erdgas (Munich)*, 117(2):62-67, 1976. 9 refs.

Experimental results indicate that the nitrogen oxide concentrations of the emissions from industrial boilers, producing as much as 90 tons of steam per hour, are decreased by 30% when gas-fired and by 20% when oil-fired. The combination of two-stage burning and firing with limited excess air, besides reducing the yield of nitrogen oxides, would even increase efficiency somewhat. A two-stage burning is one with limited air for the first stage and excess air for the second but totalling the same amount of air normally used. A reduction of the excess air from 15% to 10% resulted in a reduction of nitrogen oxides by 20% from gas-firing and by 10% from oil-firing boilers. The investigations have not yet been completed, and their continuation is highly recommended.

58117

APTIC NO. 84035

Buijserd, A. M.

SAFETY DEVICES FOR GAS APPARATUS AGAINST ATMOSPHERIC POLLUTION. (*Atmosfeerbeveiliging bij gastoestellen*). Text in Dutch. *Gas*, 96(3):71-74, 56-57, March 1976.

Problems of air pollution caused by domestic gas burners and safety devices for such burners are described. Gas burners produce combustion gases containing carbon dioxide and carbon monoxide, and little or no oxygen. The accumulation of carbon dioxide during the operation of gas burners in closed spaces results in less complete combustion and higher CO₂ and CO emissions due to the reduced oxygen content of the combustion air available. In addition, the toxicity of CO increases in the presence of CO₂, and with decreasing oxygen content in the air. Therefore, adequate safety devices will be necessary for gas burners to switch them off whenever critical CO₂ and CO concentrations are reached in the air.

58118

APTIC NO. 83043

Bump, R. L.

THE USE OF ELECTROSTATIC PRECIPITATORS FOR CONTROL OF PARTICULATE FROM LIGNITE COAL FIRING. Preprint, Research-Cottrell, Inc., Bound Brook, N. J., 27p., 1976. (Presented at the Air Pollution and Industrial Hygiene Conference, 12th, Air Quality Management in the Electric Power Industry, Austin, Tex., Jan. 28-30, 1976.)

Design criteria and operating conditions associated with electrostatic precipitators serving two lignite coal fired installations are reported. The first installation consists of four boilers, two rated at 6,640,000 lb of flue gas/hr and two at 4,025,000 lb/hr. Each boiler utilizes two precipitators, and each precipitator is energized by four 70 kilovolt power supplies. The average fly ash collection efficiency of the precipitators is 96.9% for an inlet loading of 3.52 grains/cu ft. The second installation consists of two boilers rated at 420,000 lb steam/hr and 625,000 lb/hr, respectively. The precipitators are rated at 280,000 and 390,000 actual cu ft/min at 330 F and a negative pressure of 15 in. water. Dust loadings are specified as 45,000 lb/hr and 7000 lb/hr. The precipitator collection efficiencies are 99.4 and 99.68%.

58119

APTIC NO. 76199

Calvin, E. L. and F. D. Kodras

SULFURIC ACID PLANT EMISSIONS DURING START-UP, SHUTDOWN, AND MALFUNCTION (FINAL REPORT). Catalytic, Inc., Charlotte, N. C., Environmental Protection Agency Contract 68-02-1322, Program Element 1AB013, ROAP 21ABV-014, Task 6, Rept. EPA-600/2-76-010, 353p., Jan. 1976. 10 refs.

Results are presented of a study of dual-absorption contact sulfuric acid plants, as well as single-absorption plants equipped with vent gas cleaning systems for removal of sulfur dioxide to determine the relationship between process parameters and air emissions. Processes studied were dual-absorption acid plants and single-absorption acid plants equipped with sodium scrubbers, ammonia scrubbers, and molecular sieve adsorbers. Emissions considered were SO₂, acid mist, and vent gas opacity. Relationships were developed for normal operations and compared to off-normal operations such as shutdown, start-up, malfunction, and misoperation. Process parameters and emission relationships are given. Converter bed operating temperature ranges were established and causes of SO₂ and acid mist emissions are illustrated from plant operating data. (Author abstract)

58120

APTIC NO. 76200

Capron, J. W. and R. C. Heininger

THOR V SOLVENTLESS METAL DECORATING FOR THREE-PIECE CANS. BACKGROUND. Continental Can Corp., Chicago, Ill., Environmental Protection Agency Contract, Program Element 1AB015, ROAP 21AFA-061, Rept. EPA-600/2-76-011, 21p., Jan. 1976.

A process for applying and curing a white base coating on flat sheets used for the bodies of three-piece cans is described that considerably reduces solvent emissions. The process is a single-pass line: the white coating is applied and ultraviolet-cured to a printable condition; and two conventional inks and a trailing varnish are applied, followed by baking in a gas-fired wicket oven. Compared to conventional two line operations, the process reduces total line length by 215 ft and total solvent emissions by about 66%. New equipment costs are reduced by over \$400,000, and about 8 million Btu/hr in gas consumption is saved. Pilot and field tests of the process are described. (Author abstract modified)

58121

APTIC NO. 81095

Combs, L. P. and A. S. Okuda

RESIDENTIAL OIL FURNACE SYSTEM OPTIMIZATION - PHASE I (FINAL REPORT). Rockwell International,

Canoga Park, Calif., Rocketdyne Div., Environmental Protection Agency Contract 68-02-1819, Program Element 1AB014, ROAP 21BCC-27, Rept. EPA-600/2-76-038, R-9815, 223p., Feb. 1976. 13 refs.

Methods for improving the pollutant emission characteristics and thermal efficiency of residential oil furnaces were investigated. A digital computer model was programmed to perform cyclical (transient) thermal analyses of typical warm-air oil furnaces, and design features and operating conditions were varied parametrically to study their influence on thermal efficiency. Heat in the exhaust gas was the major source of inefficiency; the efficiency was increased by burning the fuel with minimum excess air and by reducing the flue gas temperature. However, the implementation of these modifications was constrained by emission production and cost considerations. Furnace operability and pollutant emissions were studied by testing three burner types (an optimized low-emission conventional burner, a combustion gas recirculation burner, and a flue gas recirculation burner) in several combustor configurations and sizes. The optimized conventional burner in a larger than usual cooled combustion showed the best potential for minimizing emissions and maximizing efficiency. This burner and combustor configuration gave carbon monoxide, hydrocarbon, and nitric oxide levels of less than or equal to 1.0, 0.1, and 0.5 g/kg fuel burned, respectively, and resulted in a smoke level of less than or equal to a Bacharach Number 1. (Author abstract modified)

58122

APTIC NO. 83053

Devitt, Timothy W. and Thomas C. Ponder, Jr.

STATUS, RELIABILITY AND COSTS OF FLUE GAS DESULFURIZATION SYSTEMS FOR UTILITY BOILERS. Preprint, PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, 39p., 1976. (Presented at the Air Pollution and Industrial Hygiene Conference, 12th, Air Quality Management in the Electric Power Industry, Austin, Tex., Jan. 28-30, 1976.)

A review of the status and costs of flue gas desulfurization systems in the United States is presented. As of January 1976, the following flue gas systems were either operational or under construction in the United States: limestone, lime, activated carbon, double alkali, Wellman Lord/Allied Chemical, Chiyoda Thorobred 101, sodium carbonate, and magnesium oxide. There were 22 operational flue gas desulfurization systems operational on utility size boilers, 20 units under construction, and 67 units planned for construction as of January 1976. By late 1976, approximately 9000 megawatts of flue gas desulfurization capacity is expected to be installed of which 65% will be retrofit applications and 35% new power plants. Reported costs of flue gas desulfurization systems based on an industry survey ranged from 33-197 dollars/kW with an average of \$94/kW.

58123

APTIC NO. 83019

Ewan, Thomas K.

RECENT ADVANCES IN LIQUID SCRUBBING FOR FINE PARTICULATE COLLECTION. Preprint, Lone Star Steel Co., Research and Development, 13p., 1976. (Presented at the Air Pollution and Industrial Hygiene Conference, 12th, Air Quality Management in the Electric Power Industry, Austin, Tex., Jan. 28-30, 1976.)

A family of particulate collection devices known as the Hydro-Sonic air cleaners is described. The wet scrubbing devices are capable of achieving almost complete capture of extremely fine particulates in the size range below 3 micron and also scrub sulfur dioxide with ammonia. Off gas cleaning is achieved by the processes of wetting, intimate mixing, encapsulating, droplet growth, and separation of the contaminants from the cleaned gas. There are no moving parts in the gas stream, making the cleaners trouble free and easy to maintain. The by-product of the cleaning process may possess value either as a fertilizer (e.g., ammonium sulfate) or as metals reclaimed from refining or smelting processes.

58124

APTIC NO. 82795

First, Melvin W. and William C. Hinds

HIGH VELOCITY FILTRATION OF SUBMICRON AEROSOLS. *J. Air Pollution Control Assoc.*, 26(2):119-123, Feb. 1976. 10 refs.

The filtration efficiency of a fiberglass mat filter medium was investigated using a dioctylphthalate aerosol having a count median diameter of 0.8 micron and uniform polystyrene latex spheres of 0.36-1.1 micron diameter over a face velocity range of 500-3000 ft/min. Penetration curves for the liquid DOP aerosol and the solid spheres showed reasonable agreement up to a face velocity of 1000 ft/min. At higher velocities, however, the polystyrene latex sphere penetration increased, whereas the DOP penetration showed a continuing decrease. This suggests that some fraction of the solid particles can either bounce back into the air stream after contacting a fiber or be stopped and later reentrained in the air stream, whereas liquid particles adhere on contact with a filter fiber.

58125

APTIC NO. 83842

Fukuzaki, Kiyuki

DRY DENITRIFICATION METHOD FOR NOX. (*NOx no kanshiki dashoho*). Text in Japanese. *Nenryo Kyokaiishi (J. Fuel Soc. Japan)* (Tokyo), 55(586):92-98, Feb. 1976. 2 refs.

Descriptions of a catalytic ammonia reduction denitrification system using selective reduction catalysts developed by the Sumitomo Chemical Engineering Co. are given. Problems of so-called clean gas and dirty gas are dealt with by the use of different types of catalyst and pretreatment of gases. Data concerning the effects of temperature, NH₃/nitrogen oxides molar ratio, space velocity, grain size and gas composition on the removal rate of NO_x are given. Descriptions of the NH₃ decomposition catalyst developed for the decomposition of leak NH₃ in order to prevent secondary pollution are also given. Examples of clean gas denitrification systems installed in a methanol plant and NH₃ plant are given with operation records (CH₃OH plant: gas treatment capacity 200,000 N cu m/hr, reaction temperature 300 C, NH₃/NO_x molar ratio 1.0, NO_x in inlet gas 200 ppm, oxygen 7%, NO_x in outlet gas less than 20 ppm, NH₃ less than 10 ppm and denitrification rate over 90%-NH₃ plant: gas treatment capacity 200,000 N cu m/hr, reaction temperature 300-325 C, NH₃/NO_x molar ratio 0.9-1.0, NO_x in inlet gas 240-280 ppm, leak NH₃ less than 10 ppm, pressure loss 80-90 mm H₂O and denitrification rate over 90%).

58126

APTIC NO. 83771

Gage, James R.

GLASS BAG FILTERS FOR LIME KILN EXHAUST. *J. Air Pollution Control Assoc.*, 26(1):26-31, Jan. 1976. 1 ref.

The use of glass bag filters to control particulate emissions of lime kiln exhaust is discussed. Information on emissions, bag life, instrumentation, and maintenance is presented from an operating installation. The solutions to particular problems of short bag life, one due to erratic start-up and the other due to coarse dust are presented and discussed. The bag filter collectors are satisfactory for these applications and a bag life of 22-34 mo is realized. Proper hopper inlet arrangement, hydraulic dampers, and reverse air draft control are partially responsible for the good operation and bag life. (Author abstract modified)

58127

APTIC NO. 83085

Haver, F. P. and M. M. Wong

FERRIC CHLORIDE-BRINE LEACHING OF GALENA CONCENTRATE. *Bureau of Mines, Washington, D. C., RI 8105*, 18p., 1976. 10 refs.

A method for treating galena concentrate to produce lead by FeCl₃ leaching and fused salt electrolysis while minimizing sulfur oxide and Pb emissions is described. At 100 C, over 99% of the lead sulfide in the concentrate is converted to lead chloride (PbCl₂) in less than 15 min. The leach solution, com-

posed of brine (sodium chloride) containing slightly more than the theoretical required amount of FeCl₃, dissolves the PbCl₂ as it is formed, leaving a residue of elemental sulfur plus gangue. High purity PbCl₂ (greater than 99.9%) crystallizes from the leach filtrate on cooling and is electrolyzed in a low temperature fused salt cell to obtain corroding grade metal (greater than 99.94% Pb). Spent leach solution (FeCl₂) is regenerated for further use by reaction with the chloride obtained in the electrolysis of lead chloride. Other values, such as silver, copper, zinc, and S, are recovered by additional treatment of either the leach solution or leach residue. (Author abstract modified)

58128

APTIC NO. 83982

Hebbel, Gerhard

WASTE WATER INCINERATION. (*Abwasserverbrennung*). Text in German. *Chemie-Ing. Tech.*, 48(1):12-15, 1976. 14 refs.

Waste water incineration as a purification measure and when to apply it are discussed. As a rule, waste waters at a concentration of over 10 wt% of organic substances and a chemical oxygen requirement (COR) value of more than 100,000 mg O₂/l should be tested for incineration. The thermal value of the waste water indicates the cost of its incineration compared to other processes. Depending on the content of the waste water to be burned, different problems as to combustion and smoke gas purification arise. The type of incinerator used is linked to quantity, thermal value, acid or alkali proportions, and possible combinations with other purification, elimination, or recovery and steam output processes. In direct waste water incineration, the choice is between a combustion chamber and a fluidized bed furnace. In some cases, spraying into the combustion chamber of large multipurpose incinerators is possible. Other furnaces employed are the rotary cylindrical furnace, story furnace, and immersion heaters for the expulsion of volatile substances. With regard to emissions from incinerators, the technical guideline for air conservation with pollution limits and minimal temperatures promulgated in the German Federal Republic should be heeded. Incinerating costs at COR values of 120,000-150,000 mg O₂/l ran to \$0.07-\$0.16/kg, compared to a mechanical-biological waste water purification cost of \$0.20-\$0.33/kg COR.

58129

APTIC NO. 76189

Hegarty, R. and L. J. Shannon

EVALUATION OF SONICS FOR FINE PARTICLE CONTROL (FINAL REPORT). *Midwest Research Inst., Kansas City, Mo., Environmental Protection Agency Contract 68-02-1324, Program Element 1AB012, ROAP 21ADL-029, Task 24, Rept. EPA-600/2-76-001*, 51p., Jan. 1976. 45 refs.

An evaluation of the feasibility of using sonic agglomeration for improving fine particulate (0.1-3.0-micron particles) control is presented. The application of sonic agglomeration to industrial gas cleaning problems involving fine particulate control does not appear to be promising due to the high energy requirements associated with sonic agglomeration. Even under ideal conditions, energy consumption ranges from 1-15 horsepower/1000 cu ft/min. These ideal energy levels are not very competitive with other devices capable of fine particulate collection, especially when a high efficiency control system is required as a collector in order to minimize energy consumption in the sonic agglomerator. (Author abstract modified)

58130

APTIC NO. 82951

Hirasaka, Toshihiro

PRESENT STATUS OF STACK GAS DESULFURIZATION IN THE HEATING FURNACES. (*Kanetsuro ni okeru haiendatsuryu no jissai*). Text in Japanese. *Nenryo Oyobi Nensho (Fuel and Combustion)*, 43(1): 67-71, Jan. 1976.

A stack gas desulfurization facility in operation at a steel plant of Kokko Steel Works in Osaka is presented. The installation

was completed in September 1973 to comply with air pollution regulations in conjunction with the selection of bunker C oil for fuel. The caustic soda method of the wet type stack gas desulfurization process was selected for this plant because of its ability to collect dust, more than 95% desulfurization efficiency, use of an accessible and easy-to handle absorber, light maintenance work required and no secondary pollution caused by the reaction products. A summary of the facility, desulfurization process, operational achievements and points of operational management, and economical aspects of the process are discussed in detail. This process has achieved 97% desulfurization efficiency, which is more than expected and indicates a K-value of 1.16 compared to a K-value standard of 2.92. Dust released from this process is 0.036 g/N cu m, which is also much lower than the dust standard of 0.2 g/N cu m.

58131

APTIC NO. 76202

Hissong, D. W.

MOLECULAR SIEVE CONTROL PROCESS IN SULFURIC ACID PLANTS (FINAL REPORT). Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract 68-02-1323, Program Element 1AB013, ROAP 21ADH-005, Task 17, Rept. EPA-600/2-75-066, 82p., Oct. 1975. 20 refs.

An engineering analysis of the technical and economic feasibility of molecular sieve technology for the control of sulfur dioxide emissions from sulfuric acid plants is presented. After the equivalent of 10 mo of operation, one plant using this technology is still controlling SO₂ emissions to well within Federal and state regulations for sulfur acid plants. The installation is also meeting the performance guarantee of the process developer and vendor. Although the concept of a 2-year sieve life with acceptable SO₂ control is not yet demonstrated, it appears to be achievable. The total capitalized cost for molecular sieve installations is about the same as that for Wellman-Lord and dual absorption processes. Molecular sieve technology is more competitive for smaller plants and for those which already possess sieve-regeneration air driers. (Author abstract modified)

58132

APTIC NO. 82793

Hobson, M. J.

REVIEW OF BAGHOUSE SYSTEMS FOR BOILER PLANTS. J. Air Pollution Control Assoc., 26(1):22-25, Jan. 1976.

Data on the operation of baghouse systems used for the control of particulates from fossil fuel boilers were obtained from 10 commercial installations. The installations consisted of power utility plants and industrial boiler plants. Gas flows treated ranged from 23,000 to 820,000 cu ft/min. Although operating and performance data were limited, a strong relationship appeared to exist between air to cloth ratio and bag life. Collection efficiencies were generally high.

58133

APTIC NO. 83052

Hoxie, E. C. and G. W. Tuffnell

A SUMMARY OF INCO CORROSION TESTS IN POWER PLANT FLUE GAS SCRUBBING PROCESSES. In: *Resolving Corrosion Problems in Air Pollution Control Equipment*. Houston, Tex., National Association of Corrosion Engineers, 1976, p. 65-71. 5 refs.

A summary of 59 corrosion tests in nine flue gas desulfurization systems at 14 plant locations is presented. Carbon steel, low alloy steels, and Type 304L stainless steel are inadequate in the wet portions of the scrubbers. Type 316L stainless steel is sometimes subject to localized corrosive attack in scrubber environments with certain combinations of pH and chloride content. The use of molybdenum as an alloying element in stainless steels and in high nickel alloys is very effective in conferring resistance to localized attack in scrubber environments. High nickel alloys containing appreciable amounts of molybdenum such as Hastelloy alloy C-276 and Inconel alloy

AIR POLLUTION ABSTRACTS, JUNE 1976

625 can be used for critical components. Chloride stress corrosion cracking of austenitic stainless steels is generally not a problem in scrubbers designed for the removal of sulfur dioxide from flue gas.

58134

APTIC NO. 82949

Igarashi, Misao

STACK GAS DESULFURIZATION BY SODA SULFITE. (Aryusansodaho ni yoru haien datsuryu). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 43(1):11-18, Jan. 1976.

The soda sulfite method stack gas desulfurization process is one of the oldest methods and one of the first to be applied because of its high reaction rate and completely absorbed solution. The Tsukishima Kikai Co. has been producing many improved stack gas desulfurization devices, however the by-product of this process, soda sulfite, now has low market demand. Therefore the Tsukishima Kikai Co. is producing other types of stack gas desulfurization devices using soda sulfite as an absorber, which will remove sulfur dioxide in the stack gas but produce by-products other than soda sulfite with better marketability. These methods are a soda sulfate disposal method, a soda sulfate recovery method, and a soda sulfite-gypsum method. These new variations and the standard soda sulfite method are explained and the sales record of various stack gas desulfurization devices using soda sulfite as an absorber are listed.

58135

APTIC NO. 84163

Jobst, Jacob

COOLING TOWERS REDUCE POLLUTION. THE GROWING ENERGY DEMAND MAKES COOLING TOWERS INDISPENSABLE. (Kuehluerme mindern Belastung. Wachsender Energiebedarf macht Kuehluerme unentbehrlich). Text in German. Technische Umweltmag., no. 1:18-20, 1976.

The use of cooling towers for power stations using fossil fuels or nuclear energy is discussed. The heat generated in the interior of a combustion boiler converts water into steam, propelling the turbines in a power station. The steam has to be re-cooled for condensation back into water. The thermal energy extracted is discharged as waste heat to the environment. Increasingly, cooling towers are built to reduce the adverse non-controllable results of direct river water heating. Wet and dry cooling towers were designed to achieve this objective. Frequently, the cooling tower causes problems in the planning of power stations because of its size, noise, droplet emission, and water steam formation. The latter could have a negative effect on the regional climate, causing precipitation. However, modern cooling towers, such as natural draft cooling towers with tall, circular installations, do not trouble the environment. The dry cooling system, where water is in short supply of expensive, operate more economically because no additional water has to be supplied for water lost by evaporation. In order to reduce economic and ecological disadvantages to a minimum, a combination of both cooling systems has been designed. Prevention of steam emission from wet cooling towers, improvement of the steep characteristics of the dry cooling tower and control of the ground load by the dry and of the top by the wet cooling portion would be its assets.

58136

APTIC NO. 83831

Kawanaka, Akiyasu

STIRRING DEVICE IN THE STACK GAS DESULFURIZATION FACILITIES AND COMING PROBLEMS. (Haien datsuryu sochi ni okeru kakuhansochi to sono mondaiten). Text in Japanese. Kagaku Kojo (Chem. Factory), 20(2):53-55, Feb. 1976. 2 refs.

A mixing device for a wet type lime-gypsum stack gas desulfurization system and its problems are investigated. This particular mixing device is required to provide stronger and more effective mixing than ordinary mixing devices, and must fulfill

stringent conditions of temperature, slurry concentration scaling, acidity, and compositions of solution. The purpose of this device is not only general uniform mixing but also regulation of pH, initiation and continuation of the reaction, and prevention of slurry from sinking. The fundamental design should be aimed at slow rotation in consideration of the tip speed of the blade, and the kind of rotational speed which is best suited for the diameter of the blade. The material for the mixing device must be selected in consideration of temperature required for the desulfurization process, acidity, slurry concentration and compositions of the solution so that heavy corrosion or breakage of the rubber lining can be avoided. The corrosion of material generally begins on the surface, and there are local and total corrosions. The most popularly used mixing devices are SUS-316 and SUS-316L, which are made of stainless steel or have a double rubber lining.

58137

APTIC NO. 83881

Kirchhofer, H.

CHARGING OF AUTOMOBILE DIESEL ENGINES WITH COMPREX. (Aufladung von Fahrzeugdieselmotoren mit Comprex). Text in German. *Technica*, 25(2):91-103, 1976. 14 refs.

A charger set (Comprex) is described which mechanically and thermodynamically matches the high requirements for the charge of diesel-motor-powered vehicles in the capacity range from 100-40,000 hp. Comprex has only 1 rotor in which both flow media come into direct contact. The rotor itself is a bucket wheel with axially straight, frontally open ducts arranged on the circumference. Facing these rotor cells, stators are lined up controlling the inlet and exhaust of high-pressure and low-pressure gases. The charger system works by means of the hot exhausts of the motor flowing from the exhaust pipe into the cells and transferring energy to the fresh air sucked in on the opposite side. Air is compressed and accelerated and reaches the motor by way of the pressure pipe. The motor exhausts expanded in the bucket wheel are released to the outside. The propulsion of the bucket wheel, proportionate to the engine revolutions, serves to control the pressure wave process. The power necessary for it is only 0.5-1% of the engine output because compression energy is supplied by the exhaust. Only friction in the bearings and ventilation losses have to be overcome. The flexibility of the Comprex-charged engine makes soft coupling and driving with little gear shifting possible. Soft coupling and lower mean rate of revolutions signify longer life for the engine, coupling, and gear synchronization. The consumption of fuel is improved 3-8% over medium distance in Switzerland as compared to turbocharging. Emission of pollutants is decreased.

58138

APTIC NO. 81906

Klett, M. G. and J. B. Galeski

FLARE SYSTEMS STUDY (FINAL REPORT). Lockheed Missiles and Space Co., Inc., Huntsville, Ala., Environmental Protection Agency Contract 68-02-1331, Program Element 1AB015, ROAP 21AXM-030, Task 3, Rept. EPA-600/2-76-079, LMSC-HREC TR D390190, 130p., March 1976. 100 refs.

A study of industrial flare technology for the control of gaseous combustible emissions from stationary sources is presented. The study includes: an evaluation of existing flare systems, an examination of flare design and sizing criteria, an assessment of present emission problems, a recommended research program for flare emissions control, and a review of capital and operating costs associated with elevated flare and low-level flare systems. Emission factors are provided for hydrocarbon waste streams. Probable air pollutants from flare systems include: carbon monoxide, unburned hydrocarbons, aldehydes, and particulates. The relatively low flame temperatures associated with flares results in low nitrogen oxide emissions. The average yearly emissions from flares appear to constitute less than 1% of the average yearly plant emissions. (Author summary modified)

58139

APTIC NO. 84281

Kluge, Wolfgang and Gerhard Manig

STATE OF THE ART AND PROBLEMS OF FLUE GAS DESULFURIZATION IN THE GERMAN DEMOCRATIC REPUBLIC. (Stand und Probleme der Rauchgasentschwefelung in der DDR). Text in German. *Energietechnik*, 26(1):32-36, Jan. 1976.

In the German Democratic Republic the limestone additive process was selected for desulfurization of flue gases because it was found to raise power generation costs by less than 10% (it costs about 400 East German Marks/ton of removed SO₂). In an experimental plant, desulfurization efficiency reached more than 50% with twice the stoichiometric amount of limestone added. An expansion of the volume of the electrostatic precipitator of between 25 to 75% is required to maintain the same low dust emission as without an additive. The ash collected in the electrostatic precipitator can be used for neutralization of acid water and in forestry and agriculture. The amounts of limestone which must be transported to large-scale plants are enormous. At single stoichiometry, 4 kg limestone are required should the calcium oxide fraction amount to 45%/kg sulfur in the fuel.

58140

APTIC NO. 84155

Koeln, J. Anwer and F. Boegner

COAL GASIFICATION IN THE FLUIDIZED BED (WINKLER-GASIFICATION) UNDER PRESSURE. (Kohlevergasung im Fluidatbett (Winkler-Vergasung) unter Druck). Text in German. *Brennstoff Waerme Kraft*, 28(2):57-60, 1976. 21 refs.

Soft and hard coal gasification by means of the fluidized bed process (Winkler Gasification Process) under pressure are described. Coal grains, 0-8 mm in size, with a water content reduced to about 4-8%, upon oxygen gasification, were continually fed and conveyed by way of intermediate tanks and bell seals into the Winkler generator. A mixture of steam and oxygen/air was injected at various points, depending on the reaction course, in order to gasify and partly oxidize the coal. Steam by itself or mixed with carbon dioxide was blown into the deepest point of the generator in order to keep the mostly homogeneous fluidized bed of ash and coal particles in motion like a boiling fluid and to cool the coarser ash particles so that they remained solid and could be continuously removed from the bottom of the gasifier (carburetor) without causing any clogging. Steam, coal and O₂ quantities were controlled in such a way that, depending on the gas composition desired, the bed temperature was maintained at a range of about 900-1200 C with the objective of obtaining an optimal space/time yield with a high level of coal gasification and thermal output. As a result of the turbulent movement and space formation, the heavier particles of ash and residual coal dropped down and emerged from the carburetor through the ash lock. The lighter particles, about 50-70% of the generated ash, emerged at the carburetor head along with the hot gases and were subsequently incinerated with fresh coal or returned with the latter to the carburetor. No pollutants were derived from this process. The removed ash could be used for heating purposes or for cement production. The gas composition parameters, pressure, temperature, injection of oxygen, air, steam, recycling of CO₂, hydrogen, carbon and addition of fluxing or agglomerating agents, could be adjusted to the final use of the gas. The uses were for heating gas, gas for ammonia synthesis, methanol, gas turbine propellant, synthetic natural gas (SNG) or reduction gas. At present raw material costs, production of SNG was 1.5-2.5 times as expensive as natural gas. However, with a mixture of both, cost would increase only by 10%. Winkler gasification under pressure with its higher space-time output and reduced compression costs was at the top of economic considerations.

58141

APTIC NO. 81905

Koscianowski, Jan R. and Lidia Koscianowska

EFFECT OF FILTRATION PARAMETERS ON DUST CLEANING FABRICS (FINAL REPORT). Inst. of Industry of Cement Building Materials, Oswiecimska Str. (Poland), Environmental Protection Agency PL-480 Agreement No. 5-533-3, Program Element 1AB012, ROAP 21ADJ-094, Rept. EPA-600/2-76-074, 185p., March 1976.

The effect of different filter fabrics and filtration parameters on dust filtration efficiency was studied. Cement and coal dusts with mass median particle diameter of 7.5 micron were filtered with three types of polyester fabrics and one polyamide fabric. Dust filtration processes were classified into three basic types: an initial phase starting with unused fabric and terminating when the pressure drop reaches a predetermined level, an intermediate phase which terminates when the residual dust load in the fabric remains constant after each cleaning cycle, and a final phase which is characterized by the fabric being fully loaded with dust and having a stabilized pressure drop and residual dust load immediately after cleaning. Excessive filtration velocity appears to destroy the dust cake structure as a result of the creation of ducts and canals and thus lowers the dust removal efficiency. (Author conclusions modified)

58142

APTIC NO. 82956

Koumi, Hideo

ELECTRIC DUST COLLECTOR OF WASTE INCINERATOR. (Gomishokyakuro no denkishujinsochi ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 43(1):51-59, Jan. 1976.

A dry type dust collector suitable for waste incinerators is described. The principle of dry type electric dust collectors, and a summary of waste incinerators, the selection of dust collectors for incinerators, and the factors to be considered in planning the installation of an electric dust collector in a waste incinerator are discussed. The Takuma Electric Dust Collector is introduced; it is designed to accommodate the specific conditions required to collect dust from waste incinerators and has achieved efficient performance in actual use. The structure and the characteristics of the Takuma Electric Dust Collector is itemized as follows: dust collecting terminal, hammering of the dust collecting terminal, discharge electrode, hammering of the discharge electrode, gas rectifying plates, scraper conveyor, screw conveyor, rotary feeder, and dumper.

58143

APTIC NO. 84250

Lange, K. H. and H. Maghon

GAS TURBINE COMBINED WITH COAL-FIRED POWER PLANT. (Gasturbinen im Kombi-Block). Text in German. VGB Kraftwerkstechnik, 56(1): 17-20, 1976.

A comparative study of a conventional coal-burning power station and of the latter with a serially connected natural-gas-run turbine whose waste gas was used as a combustion air in the furnace of the steam generator is presented. Depending on the inlet temperature into the gas turbine, the net power gain due to the combination varied between 14.22-19.95% as compared to pure steam power and 41-42.1% in net efficiency as against 37.64% for coal power alone. Although the entire waste steam proportion was equal in both cases up to and including the cooling tower, related to its net output, the combined process lost of the specific cooling-heat yield of the pure steam power combined to the surroundings because of the gas turbine output. The smoke gas quantity discharged was reduced to 84-80% attributable to the proportion of natural gas and the rotational air pre-heater absent in the combination. The sulfur dioxide emission was lowered to 76-72% and total ash to 70-64%. With additional fresh air supplied to the waste gas flow from the gas turbine, its output could be readily raised to the presently customary 600-700 Mw and could further be increased by serially connecting 2 gas turbines. Preliminary results from the combined power stations demonstrated remarkable output and rate of efficiency increases.

16

58144

APTIC NO. 83985

Lavanchy, Emil and Bernhard Anderau

ELIMINATION OF PHOSPHATE CONTAINING WASTE WATER. (Vernichtung von phosphat-haltigen Abwässern). Text in German. Chemie-Ing.-Tech., 48(1):15-21, 1976.

The elimination of industrial waste waters containing phosphates is discussed. The manufacture of optical brighteners results in a waste water with about 6% sodium dimethylphosphate. Accompanying components are sodium chloride, dimethyl formamide, and sodium formate. For the removal of these ingredients from the waste water, hydrolysis, precipitation, activated carbon absorption, ion exchange, extraction, and biological degradation were tested. None of the processes was either economically feasible or ecologically satisfactory. The only variation available was thermal destruction at 1000-1100 C. An admixture of calcium hydroxide prior to thermolysis yielded water insoluble tricalcium phosphate which could be deposited. The installation consisted of separation and concentration of waste water, a cyclone combustion chamber, a radiation boiler for heat recovery, a cooling tower, and an electrostatic filter. The ecological objective was accomplished. The operational safety of the installation is still being improved. Solid deposits in the combustion chamber, cooling tower, and electrostatic filter caused problems still being resolved. In 1974, operational expenses averaged \$55/ton, despite greatly increased fuel prices.

58145

APTIC NO. 76201

Leith, David, S. N. Rudnick, and M. W. First

HIGH-VELOCITY, HIGH-EFFICIENCY AEROSOL FILTRATION (FINAL REPORT). Harvard School of Public Health, Boston, Mass., Environmental Protection Agency Grant R801399-02, Program Element 1AB012, ROAP 21ADJ-057, Rept. EPA-600/2-76-020, 187p., Jan. 1976. 471 refs.

Pilot and bench-scale studies of the dust collection characteristics of fabric filters were conducted. Techniques for measuring dust deposit porosity as a function of cloth characteristics and filtration velocity were developed along with a method for impregnating and slicing the dust deposit for examination under an electron microscope. In tests with a pulsejet pilot filter, fly ash penetration decreased as the dust deposit thickened, increased with increasing filtration velocity, and remained relatively constant for particles down to 0.30 micron in diameter. Chemically tagged fly ash was used to investigate three dust escape mechanisms. Penetration by straight-through dust loss fell off rapidly after cleaning but later increased again. Seepage of dust through the fabric was constant throughout the filtration cycle. Dust lost as pinhole plugs increased after cleaning but later declined. Fabric cleaning was a problem with both pulsejet and shaker cleaned filters during high velocity operation. (Author abstract modified)

58146

APTIC NO. 83979

Leuppi, F.

DUST REMOVAL AT THE IRON MELTING FURNACES OF THE FOUNDRY ERZENBERG AG, LIESTAL. (Die Entstaubung von Eisen-Schmelzöfen der Giesserei Erzenberg AG, Liestal). Text in German. Gesundheitstsch., 10(1):18, 1976.

A new dust-removal system developed for a Swiss foundry to comply with air purity standards is discussed. Its object is to clean optimally the waste gases of the alternately run cold-blast cupola furnaces during every phase of the operation by dry filtration with the help of tissue filters. In order to remove waste gas quantities of 30,000 cu m/hr at temperatures ranging from 400-800 C, a non-extinguishable heating oil continual burner was installed behind the charging door to eliminate carbon monoxide by combustion. In the dust separator proper, a Luehr-dry filter, the raw gases strike a filtration surface of about 957 sq m. An automatically controlled pulsating counter-

air current (cyclone) continually cleansed the filter, zone by zone, of the finest retained dust and smoke particles at a constant pressure loss, thus creating permanent suction conditions. The reduction of about 550 mg/cu m of dust in the raw gas to about 5.6 mg/cu m in the purified gas amounted to a dust separation level of exactly 99%. No steam condensation in the exhaust air occurred at normal weather conditions. Sound isolation of ventilators and motors made it possible to go below the legally permissible basic noise levels.

58147

APTIC NO. 83983

Loeffler, Friedrich

POSSIBILITIES AND LIMITS OF FINE DUST COLLECTION. (Moeglichkeiten und Grenzen der Feinstaubabscheidung). Text in German. *Chemie-Ing.-Tech.*, 48(1):26-34, 1976. 13 refs.

Possibilities and limits of fine dust separation were presented. In West Germany, technical guidelines for air conservation were introduced in 1974. They established limits for maximally permissible emissions and were stricter with regard to dust separation than before. More attention was directed to the type of substance and the fineness of dust. Cyclones, wet separators, cloth filters, and electrostatic dust removers were tested. Among them, wet separators had a wide field of application because they could be adjusted to a variety of conditions. They not only separated dust, but also soluble gases from the washing fluid. Wet separators were 70% of all dust separators (30%, according to another source). The suitability of them as fine dust removers was determined on the basis of separation graphs, which depend on the particulate size. The problem of which process to select involved many details. Economic considerations required a close examination of cost estimates.

58148

APTIC NO. 81885

Mathews, John C., Faust L. Bellegia, Charles H. Gooding, and George E. Weant

SO₂ CONTROL PROCESSES FOR NON-FERROUS SMELTERS (FINAL REPORT). *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1491, Program Element 1AB013 and 1AB015, ROAP 21ADC-059, 21AUY-040, 21AUY-041, Rept. EPA-600/2-76-008, 384p., Jan. 1976. 109 refs.*

Various absorption-based sulfur dioxide control systems are evaluated in terms of their effectiveness for controlling weak SO₂-containing gas streams at primary copper smelters. Control processes considered include: lime/limestone scrubbing, the Wellman-Lord process, double-alkali throwaway processes, magnesium oxide scrubbing, the dimethylaniline/xylydine process, the citrate process, and the ammonia process. Capital and operating cost relationships are developed for each specific process and for a range of gas flows and SO₂ concentrations. Separate general costs for gas pretreatment and end-of-the-line SO₂ utilization facilities are also provided. A review of 13 primary copper smelters in the United States which still generate weak SO₂ streams is presented in terms of their current operation and active programs to control or eliminate weak SO₂ streams. Appropriate SO₂ control processes are matched with individual smelters, and related cost estimates are developed. (Author abstract modified)

58149

APTIC NO. 83690

Matsuda, Ikuo

OXIDATION STYLE OF SULFITE SOLUTION AND ITS EQUIPMENT. (Aryusanen yoeiki no sanku hoho marabino sono sochi). Text in Japanese. (Mitsui Mokuzai Kogyo K. K. (Japan)) *Japan. Pat. Sho 51-1677. 5p., Jan. 19, 1976. (Appl. Aug. 25, 1972, 3 claims).*

An improved oxidation method and device for a sulfite solution that treats the sodium sulfite of chemical oxygen demand (COD) values from 7000-9000 ppm discharged from a com-

bustion exhaust gas desulfurization process is described. The conventional oxidation method for sulfite solution by aeration has poor performance; for instance, a half-hour of aeration removes only 15 to 20% COD, and an aeration period of 20 hr is necessary to reach a COD removal rate of 78-85%. Therefore an effort was made to invent a new oxidation device which can largely reduce the time requirement for the oxidation process. The improved and economical oxidation device not only gives effective air contact to the sulfite solution but also accelerates the momentum of the liquid molecules by providing forced circulation at a rate of twice a minute. A COD removal rate of 99.5 to 100% with a time requirement of 50-60 min was achieved by maintaining the pH at 7.5 to 9.0 and a temperature of 55-80 °C, and using red vitriol (40-80 ppm) as a catalyst.

58150

APTIC NO. 81097

Meyer, J. W., W. J. Jones, and M. M. Kessler

ENERGY SUPPLY, DEMAND/NEED, AND THE GAPS BETWEEN; VOLUME I - AN OVERVIEW (FINAL REPORT). Kellogg (M. W.) Co., Houston, Tex., Environmental Protection Agency Contract 68-02-1308, Program Element 1AB013, ROAP 21ADE-010, Task 27, Rept. EPA-600/2-76-044a, MIT-EL 75-012/-013, 78p., March 1976. 164 refs.

An overview of selected literature pertaining to energy supply and demand, supply/demand imbalances, and developments needed to redress imbalances is presented. Alternative energy sources examined include: the production of liquid and gaseous fuels from coal, the extraction of oil from shale, solid waste fuels, solar power, wind power, geothermal power, and the use of ocean currents and thermal gradients. Energy conservation is reviewed as an alternative to present energy usage patterns. Electric power production is examined both as a source of energy supply and as an element of energy demand, with particular emphasis on waste heat utilization from nuclear and steam plants, hydroelectric power, and nuclear fission electric power.

58151

APTIC NO. 81897

Meyer, J. W., W. J. Jones, and M. M. Kessler

ENERGY SUPPLY, DEMAND/NEED, AND THE GAPS BETWEEN. VOLUME II - MONOGRAPHS AND WORKING PAPERS (FINAL REPORT). Kellogg (M. W.) Co., Houston, Tex., Environmental Protection Agency Contract 68-02-1308, Program Element 1AB013, ROAP 21ADE-010, Task 27, Rept. EPA-600/2-76-044b, 300p., March 1976. 129 refs.

Monographs and working papers dealing with energy supply and demand and alternatives to fossil fuel resources are presented. Specific topics covered include: solar energy, wind energy, ocean thermal energy conversion, geothermal energy, hydroelectric power, shale-derived oil, the use of solid waste for electric power generation, energy from wood and other biomass products, hydrogen fuel, gas turbines, fuel cell generation of electric power, residential and commercial energy utilization, synthetic fuels, energy conservation, and environmental/safety issues relating to fast breeder reactors.

58152

APTIC NO. 83689

Mishimi, Fumio, Yojiro Ikeda, and Noboru Nishioka

STACK GAS DESULFURIZATION METHOD AND ITS EQUIPMENT. (Haiken datsuryuho oyobi sono sochi). Text in Japanese. (Mitsui Mining and Smelting Co., Ltd. (Japan)) *Japan. Pat. Sho 51-1237. 4p., Jan. 14, 1976. (Appl. Feb. 4, 1972, 2 claims).*

A method and device to recover highly concentrated sulfur dioxide from a solution containing sulfur dioxide collected from stack gas are described. The conventional wet-type desulfurization method using magnesium hydroxide recovers sulfite by simultaneously thermally decomposing magnesium sulfate (Mg SO₄), magnesium sulfite (Mg SO₃) and magnesium

hydrogen sulfite $Mg(HSO_3)$. The $MgSO_4$ thermally decomposes at over 800 C in spite of application of a reducing agent, and requires a direct heating pyrolysis process which recovers only poorly concentrated sulfur dioxide. The characteristic feature of the new method is the separation of the magnesium hydroxide slurry containing collected sulfur dioxide from the stack gas into a liquid portion which mainly consists of $MgSO_4$ and a solid portion which mainly consists of $MgSO_3$. This solid portion is thermally decomposed by a selective indirect heating type pyrolysis process at 500-800 C to recover highly concentrated sulfur dioxide. Magnesium oxide is recovered as a by-product and recirculated into the stack gas desulfurization system.

58153

APTIC NO. 84396

Mockridge, P. C. and A. Saleem

SOME CORROSION PROBLEMS AND SOLUTIONS ENCOUNTERED IN UTILITY BOILER FLUE GAS SCRUBBING INSTALLATIONS. Preprint, *Chemico Air Pollution Control Co.*, New York, 6p., 1976. (Presented at Recent Corrosion Problems in Air Pollution Control Equipment Conference, Jan. 20-23, 1976.)

Corrosion problems encountered with scrubbing installations serving utility boiler flue gas applications are reviewed. A venturi scrubber used for treating the off gas from a boiler fired with high ash, low sulfur anthracite coal experienced serious corrosion in a conical section about 10 ft below the venturi throat where scrubbing water eroded away the polyester lining. The situation was corrected by installing an acid brick lining held with a furan resin mortar. Other problems included wear in stainless alloy 20 recycle pumps and corrosion of stainless steel pipe fittings. Another installation experienced abrasion and corrosion of rubber lined plug cock valves used to throttle bleed from rumented. The CO_2 concentration for the year 1960 is estimated to be about 315 ppm as compared with a base level of 290 ppm for the year 1890. Average annual increases of about 0.2% of the 1960 level are projected. Although increasing CO_2 concentrations are capable of causing an elevation in the atmospheric temperature, the effect of CO_2 on the climate is uncertain because of a lack of reliable worldwide radiation measurements and the interfering effects of changes in cloudiness and atmospheric turbidity. The dissipation of waste heat is the major problem associated with human energy production. Aside from its warming effect on the atmosphere, waste heat is also responsible for changes in the convective pattern of the atmosphere.

58154

APTIC NO. 83868

Morita, Tomijiro, Isao Funabashi, Ko Sasagawa, Makoto Tanabe, and Masami Sugai

MANUFACTURING METHOD OF STACK GAS DESULFURIZATION CALCIUM SULFITE. (Haidatsu arysan karushiumu seizoho). Text in Japanese. (Kureha Chemical Industry Co., Ltd. (Japan)) Japan. Pat. Sho 51-1236. 5p., Jan. 14, 1976. (Appl. Jan. 17, 1972, 2 claims).

An improved calcium sulfite manufacturing method is described using the wet indirect type stack gas desulfurization process which employs an aqueous solution of alkali sulfite as a circulated absorption solution to treat the sulfur dioxide contained in industrial exhaust gas. The characteristic of this method is the incorporation of a process to transform and separate the alkali sulfate, a by-product of the sulfur dioxide absorption solution, into gypsum. In the conventional method, alkali sulfate produced and accumulated in the aqueous solution of alkali sulfite lowered the sulfur dioxide absorption efficiency and was either removed or transformed to an alkali sulfite. Therefore, as a result of various tests and research, a new and efficient calcium sulfite manufacturing method was completed as a result of an invention of an effective method to transform alkali sulfate into alkali sulfite using only calcium sulfite, lime or limestone and sulfuric acid supplemented from outside the system for the total processes. For example, the exhaust gas from a power station containing 1400 ppm of sul-

fur dioxide at a velocity of 5000 N cu m/hr treated with an absorption solution of 988 kg will achieve a sulfur dioxide absorption rate of 98%, and 70% of the total alkali sulfate will be transformed at 40 to 45 C.

58155

APTIC NO. 83670

Muermann, H.

CLOTH FILTERS, A CONTRIBUTION TO ENVIRONMENTAL PROTECTION. (Gewebefilter, ein Beitrag zum Umweltschutz). Text in German. *Verfahrenstechnik*, 10(1):9-14, 1976.

New bag filter and pocket filter designs are described. Tissue filters have dust separation efficiencies of up to 99.9%, thus guaranteeing residual dust concentrations of 2 mg/cu m or lower. Natural fiber filters are limited in their use to about 100 C temperature, and may be attacked by alkalies and sulfur dioxide, while synthetic fiber filters, resistant to chemicals and molds, can be used up to 150 C. Bag filters and pocket filters with automatic dust removal by vibration or compressed air have been developed for continuous operation. In one bag filter model, dust is removed by short puffs of compressed air at automatically controlled intervals.

58156

APTIC NO. 84045

Nakayama, Mitsushige

SYNTHESIS OF METHANOL FROM NATURAL GAS AND METHANOL COMBUSTION. (Tennen gasu no metanoru ka to sono nensho). Text in Japanese. *Nenryo Kyokaiishi (J. Fuel Soc. Japan (Tokyo))*, 55(585):2-11, 1976. 6 refs.

The production of synthetic methanol, as a liquid chemical fuel, from natural gas (associated gas) is investigated and the operational data of boilers using methanol as fuel is introduced. Methanol fuel is called clean fuel because there are no sulfur oxides and only a minimum amount of nitrogen dioxide exhausted from combustion of methanol. However, its calorific value is less than half of the liquid fuels, which has thus far slowed efforts for research and development of synthetic methanol fuel. The following subjects are discussed in detail: synthesis of methanol by catalytic steam reforming of hydrocarbons, stabilized supply of methanol and economic aspects, characteristics of combustion of methanol, and various problems related to the mixing of methanol and other fuels such as flame temperature, exhaust gas products, color of flames and radiation rate, fuel injection nozzle, and property of the methanol/fuel oil mixture.

58157

APTIC NO. 83045

Nannen, Lawrence W.

EPRI'S ROLE IN FLUE GAS DESULFURIZATION. Preprint, *Electric Power Research Inst.*, Palo Alto, Calif., 11p., Jan. 30, 1976.

Flue gas desulfurization research programs sponsored by the Electric Power Research Institute are reviewed. The goals of EPRI research projects are to develop a reliable commercial design basis for both throwaway scrubbing systems and regenerable flue gas desulfurization technology. Emphasis is currently being placed on lime/limestone scrubbing in terms of throwaway systems since the technology for this process is the most advanced for present commercial applications to utility boilers. Advanced regenerable processes being researched by the EPRI include: the Wellman Lord process, magnesium oxide scrubbing, the CatOx process, and a regenerable calcium sulfite/sulfate process. The most viable utility choice for near term sulfur dioxide control appears to be throwaway scrubbing processes involving the use of lime or limestone as a reagent and the production of a calcium sulfite/sulfate waste product.

58158

APTIC NO. 83060

Nicholas, D. M., Y. T. Shah, and I. A. Zlochower

OXIDATION OF AN AUTOMOBILE EXHAUST GAS MIXTURE BY FIBER CATALYSTS. *Ind. Eng. Chem.*, 15(1):29-35, March 1976. 17 refs.

The usefulness of a platinum impregnated porous fiber catalyst for the oxidation of an automobile exhaust mixture was analyzed experimentally. Experimental data for the conversions of carbon monoxide, ethylene, and propane by a reactor packed with fiber catalysts were obtained. The preheat temperature was varied from approximately 180 to 560 C and the gas hourly space velocity was varied from 20,000 to 70,000/hr. A lesser amount of fiber catalyst carrier performed better than the two conventional catalysts tested (alumina beads and silica gel beads), under all reaction condition, when the average pore size of the fiber catalyst was large and when the fiber catalyst was tightly packed in the reactor. Both steady state and transient conditions were examined. The fiber catalyst required a much lower preheat temperature to initiate the oxidation than that required by the conventional catalysts. (Author abstract modified)

58159

APTIC NO. 82957

Nojiri, Hideo

PRINCIPLE AND APPLICATION OF WET TYPE DUST COLLECTOR UTILIZING LIQUID FLUIDIZED FLOTATION BED. (Ekitai ryudo fuyuso o mochiita shishiki shujin no genri to oyo). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 43(1):1-10, Jan. 1976.

Wet type dust collectors utilizing a liquid fluidized flotation bed, Airmix and Fluomix, developed by Platt, Daniel, and Paulman of France is investigated. The principle and theory of the formation of liquid fluidized flotation state that in the vertically erect diffuser, the balance of the upward gas flow and the weight of liquid drops will form the fluid fluidized flotation. The following related subjects are discussed: the behaviors of the liquid drops in the diffuser, the working principle of the dust collectors using a fluidized flotation bed, pressure loss in the throat section of the diffuser, collection efficiency, and loss of water are all discussed. Airmix is suitable for collection of dust of a diameter ranging from 0.5-20 micron, however for sub-micron dust there are various modifications that can be made to increase the efficiency of the device. Industrial applications of this collector are seen in mist collecting, cooling hot gas, and removing pollutants from gas.

58160

APTIC NO. 83066

O'Neill, E. P., D. L. Keairns, and W. F. Kittle

A THERMOGRAVIMETRIC STUDY OF THE SULFATION OF LIMESTONE AND DOLOMITE - THE EFFECT OF CALCINATION CONDITIONS. *Thermochimica Acta*, 14(1-2):209-220, Jan.-Feb. 1976. 19 refs. (Presented at the North American Thermal Analysis Society Meeting, 5th, Peterborough, Canada, June 8-14, 1975.)

A pressurized thermogravimetric analysis system, constructed to operate with corrosive gases and connected to a programmable calculator used as a data acquisition system, was used to study the isothermal reaction of sulfur dioxide with limestones and dolomites at pressures from 1 to 10 atm and temperatures from 750 to 1050 C. The sulfation reactions were studied where calcium carbonate is the stable form of the reacting solid and where calcium oxide is the stable form of the sorbent. Both sample size and gas flow rate strongly influenced the kinetics. However, a high partial pressure of carbon dioxide during calcination of limestone and dolomite is the dominant factor in increasing the sorbent capacity in sulfation. Since high partial pressures of carbon dioxide are generated in the fluidized bed combustion of fossil fuels at pressure, sorbent utilization should be enhanced, by pressurized operation. The increase in partial pressure of SO₂ caused by system pressurization leads to modest increases in reaction rate during four fifths of the sulfation reaction. Thermogravimetric studies qualitatively replicate the effect of temperature on sulfur dioxide retention in fluidized bed combustion. (Author abstract modified)

58161

APTIC NO. 84042

Pfenninger, Hans

COAL AS A FUEL FOR STEAM AND GAS TURBINES. (Die Kohle als Brennstoff fuer Dampf- und Gasturbinen). Text in German. *Brown Boveri Mitt.*, 62(10/11):456-465, Oct.-Nov. 1975. 2 refs.

Studies and experiments on coal gasification as an integrated part of electricity generation at the Brown Boveri Co. are described. The increasing oil prices make coal as a power plant fuel increasingly attractive, a development which, however, requires adequate control measures to abate particulate and sulfur dioxide emissions. Sulfur, present in gasified coal in the form of hydrogen sulfide, can be removed by wet absorption or by dry adsorption, e.g., on bog iron ore, at considerably lower costs than can SO₂ from flue gases. Dust separation efficiencies of 80-97%, corresponding to a residual particulate concentration of 0.045 g/N cu m, were reached in experiments at Brown Boveri. Pressurized gas generators can be advantageously integrated within the complex process of electricity generation by the use of expansion turbines and gas turbines which use the purified gas as a fuel. Thermal efficiencies of up to 40% can be reached by such integrated systems.

58162

APTIC NO. 82217

Pischinger, Franz and Karl-Josef Kloecker

INVESTIGATIONS ON THE COMBUSTION PROCESS IN STRATIFIED CHARGE ENGINES. (Untersuchungen ueber die Verbrennung in Schichtladungsmotoren). Text in German. *Motortech. Z. (Stuttgart)*, 37(1-2):27-32, 1976. 25 refs.

The combustion in stratified charge engines can be influenced by several parameters. Consequently, numerous configurations of stratified charge engines are possible. An overview of the various stratified charge processes which have been developed to date is given. An experimental study of a stratified charge engine with prechamber injection is described, with special attention to the degree of charge stratification, construction of the injection nozzle, position of the spark plug electrodes in the prechamber, injection timing, timing of ignition and throttling of the intake air. An optimized stratified charge engine with prechamber is compared to a conventional spark ignition engine, and to engines using other stratified charge processes. Using a mathematical model of the process, possible reasons for the significant improvements in nitric oxide emissions are discussed.

58163

APTIC NO. 83096

Quinn, Edwin J. and Ronald L. Dieck

FLAME AND SMOKE PROPERTIES OF FILLED AND UNFILLED POLY(ARYLOXYPHOSPHAZENE) HOMOPOLYMERS. *J. Fire Flammability*, vol. 7:5-18, Jan. 1976. 15 refs.

A large number of poly(aryloxyphosphazene) homopolymers were prepared and tested for their flammability and smoke generating potential. They were evaluated using the Oxygen Index and NBS Smoke-Density tests. The polymers were non-burning in air, tended to melt, and evolved some smoke when exposed to a flame. Three fillers: alumina trihydrate, calcium carbonate, and hydrated silica, were evaluated at three concentration levels for their effect on the flame and smoke properties of three poly(aryloxyphosphazenes). Oxygen index values were increased by filler addition, alumina trihydrate greater than hydrated silica greater than calcium carbonate. Also, the dripping of samples during open-flame heating was controlled by filler addition. Polymers with alkoxy-substituted phenols on the phosphorus-nitrogen backbone had markedly reduced smoke evolution when compared to the corresponding alkyl-substituted polymers. Smoke evolution was reduced by the addition of filler: calcium carbonate greater than hydrated silica, which was much greater than alumina trihydrate. (Author abstract modified)

58164

APTIC NO. 83786

Reither, Karl

RESULTS OF EXPERIMENTS WITH A PILOT PLANT FOR THE ELIMINATION OF ODORS WITH AQUEOUS O₃-SOLUTIONS. (Versuchsergebnisse mit einer Pilot-Anlage zur Geruchsbeseitigung mit waessrigen O₃-Loesungen). Text in German. Chem.-Ing.-Tech., 48(1):44-46, 1976.

A portable pilot plant for the removal of malodorous flue gas components and the basic parameters of an industrial unit are described. The pilot plant, adopting the Fresenius S-KT method, is composed of a two-stage gas scrubber with separate scrubbing liquid cycles. The first stage is normally operated with 10% sodium hydroxide and the second stage with 5% sulfuric acid. Ozone, generated in a portable Demag ozone generator, can be injected in each stage. The malodorous substances to be eliminated from the waste gas are absorbed in the scrubbing liquid and destroyed through oxidation by ozone in aqueous solution. The plant is completed with a high-efficiency droplet separator. At a throughput of 350-800 cu m/hr and an ozone consumption of 20-19 g/hr, it was possible to keep the residual ozone concentration in the gas discharged below 0.1 ppm. An industrial unit has been designed for a aluminum foundry for a capacity of 50,000 cu m/hr. Based on 120 hour-operation per week, the specific costs amount to \$6.50/hr. The efficiency of the separation of malodorous substances ranges from 90-99%.

58165

APTIC NO. 81887

Rosenberg, Harvey S.

MOLECULAR SIEVE NOX CONTROL PROCESS IN NITRIC ACID PLANTS (FINAL REPORT). Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract 68-02-1323, Program Element 1AB014, ROAP 21ADH-008, Task 17, Rept. EPA-600/2-76-015, 74p., Jan. 1976. 23 refs.

An engineering analysis of the feasibility of molecular sieve technology for the control of nitrogen oxide emissions from nitric acid plants is presented. After 6 mo of operation at one commercial plant, molecular sieve technology is still controlling NO_x emissions to well within the New Source Performance for nitric acid plants which is equivalent to about 200 ppm NO_x in the tail gas. Nitrogen oxide emissions at another commercial plant using molecular sieve technology are also below the New Source Performance Standards after 10 mo of operation despite the fact that the sieve was damaged by accidental backup of nitric acid. Molecular sieve technology appears capable of achieving an average effluent NO_x concentration of 50 ppm. The 2-year sieve life is not yet demonstrated, though it appears attainable. The capitalized cost for molecular sieve processes is higher than that for catalytic reduction processes and lower than that for extended absorption processes. Molecular sieve technology becomes economically competitive with catalytic reduction when the price of natural gas reaches \$2.4/1000 cu ft. (Author abstract modified)

58166

APTIC NO. 84246

Rueb, Friedmund

DUST EXHAUST AND COLLECTION IN FOUNDRIES.

(Absaugung und Entstaubung in Giessereien). Text in German. Wasser Luft Betrieb, 20(1):25-29, 1976. 2 refs.

Exhaust and dust separation measures in the various sectors of foundry work as well as air conservation are presented. The initial phase concerns getting hold of the total waste gas, exhausting it and purifying the waste air so that it can be released to the outside without any reservations (core-closing machines). Harmful steam and vapor can be exhausted by a Hottinger turnstile at a speed of 0.4-0.6 m/sec. Toxic components from waste gases arising during the cold-box process are washed away up to 90% by a venturi washer with 10% sulfuric acid as washing fluid. Exhaust of casting and cooling lines involves air purification by means of vapor suction.

Smelting furnaces and casting sites are equipped with suction cowls in shape and arrangement adjusted to each task. Optimal dust control is provided at ejection sites and during sand processing. The latter requires sand coolers on top of which washers are directly mounted. Dust separation of cast objects requires suction of cleansing tables and washing of exhaust air by high-efficiency wet separators. Dust removal from cupola furnaces is mostly carried out by venturi washers. One plant uses central dry-dust-separation with fully automatic purification by way of compressed air in 1 induction furnace, 2 light-arc furnaces and 1 spheroidal graphite iron station. Wet washing and dry separation of dusty waste air are applied in separation sections of foundries for dust removal depending on the kind of treatment necessary.

58167

APTIC NO. 82950

Saito, Masao

PRESENT STATUS OF STACK GAS DESULFURIZATION BY LIME-GYPSUM METHOD. (Sekkaisekkoho ni yoru haen datsuryu no jissai). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 43(1):29-41, Jan. 1976.

The CM method, a type of lime-gypsum method of stack gas desulfurization, developed by the Chubu Electric Power Co. and engineered by the Mitsubishi Kakoki Co. is presented. Operational experience achieved at a test plant of 15,000 N cu m/hr installed at the Chubu Electric Power Central Technical Institute resulted in the construction of demonstration models of the limestone absorption type stack gas desulfurization device of 250,000 N cu m/hr at Yokkaichi Plant of Ishihara Sangyo, and a hydrated lime absorption type stack gas desulfurization device of 60,000 N cu m/hr at Yokkaichi Plant of Mitsubishi Gas Kagaku. Both of these demonstration plants have been operated since April 1974 and have accumulated a total of 8500 and 7000 running hours, respectively. The characteristics and processes of the CM type stack gas desulfurization facility are discussed followed by discussions of a daily check up of the lime-gypsum method stack gas desulfurization device, general precautions for handling the device, operational principal units, operational troubles and countermeasures, and factors for the selection of a stack gas desulfurization device.

58168

APTIC NO. 83596

Saleta, L.

USE OF METALLIZED ACTIVE CARBON FOR DESULFURIZATION OF GASES. Int. Chem. Eng., 16(1):97-99, Jan. 1976. 2 refs.

The sulfur removal capacity of metallized activated carbon was investigated over an extended period of time. The investigation was made at a pressure of 300 + or - 100 kPa (3 + or - 1 atm) and a loading of 300/hr. The sulfur removal capacity of this adsorbent was a minimum of 90% for an on-stream period of 5000 hr. After 5000 to 10,000 operational hours, a practically linear decrease of the adsorption capacity as a function of time was observed. (Author conclusions modified)

58169

APTIC NO. 83834

Sano, Hiroshi

AIR-OXIDATION METHOD OF SULFUROUS ACID SOLUTION BY PERLITE ADDITION. (Paraito tenka ni yoru arusan suiyoeki no kuki sankaho). Text in Japanese. (General Manager of Agency of Industrial Science and Technology (Japan)) Japan. Pat. Sho 51-1234. 4p., Jan. 14, 1976. (Appl. March 1, 1972, 1 claim).

An improved air oxidation method for speedy oxidation of sulfite contained in an aqueous solution to transform it to sulfate is presented, in which perlite, 0.1 to 2 wt%, is added to the total sulfite solution with a pH value of 5 to 10 for air oxidation. Desulfurized waste water from the stack gas desulfurization process is usually oxidized because of the harmful nature of the sulfite ion, however such air oxidation must be

accompanied quickly so large expensive equipment will not be required. Various methods are tested and applied by none of the methods, using soluble catalysts are ideal. The characteristic of the new process is the incorporation of a solid catalyst, perlite, a light and powdered inorganic substance which remains completely insoluble. The catalysis of the sulfite ion-air oxidation in the aqueous solution dramatically increases reduction of the sulfite ion proportionally to the increase in the amount of perlite added. The conditions which affect the air oxidation reaction are; a pH of 6 to 9 where the oxidation reaction velocity reaches its maximum while the oxidation reaction velocity is 0 at a pH of 4; concentration of sulfite ion 1 to 10 minus 2 mol/l must be maintained; the kinds of sulfite to be effectively oxidized by perlite are sodium sulfite and ammonium sulfite; the total amount of oxidation is proportional to the duration of mixing and ventilation, while the logarithmic value of sulfite concentration is proportional to the duration.

58170

APTIC NO. 82212

Sato, Hiroyoshi

MAINTENANCE OF STACK GAS DESULFURIZATION FACILITIES. IN CASE OF ASAHI GLASS CO., LTD. (*Haiei datsuryusochi no meintenansu (1). Asahigarasu, Keihin Kojo no keisu*). Text in Japanese. Puranto Enginia (Plant Eng.), 8(1):64-70, Jan. 1976.

Maintenance requirements for a stack gas desulfurization device at the Keihin Plant of Asahi Glass are described. This company has been positively involved in research and development of stack gas desulfurization devices and dust removing processes. The stack gas desulfurization process developed by Asahi Glass for exhaust gas containing large amounts of oxygen, sulfur dioxide, and sodium sulfide anhydride is unique and internally recognized. The Keihin Plant of Asahi Glass completed the installation of this stack gas desulfurization device in June 1973. Maintenance work conducted during the past 2-1/2 years on the stack gas desulfurization device (exhaust gas treating capacity of maximum 50,000 N cu m/hr to 95,000 N cu m/hr, operation and maintenance of the device, problems with the device and existing solutions, are discussed. Maintenance work is aimed at minimizing the corrosion to which the entire device is subject. Therefore, selection of the most suitable materials and technological developments for making these materials for environmental pollution control devices are the future objects of the plant engineers.

58171

APTIC NO. 83984

Schaffrath, Manfred

THE PROPERTIES OF METHANOL AS A MOTOR FUEL. (*Die motorischen Eigenschaften von Methanol*). Text in German. Erdoel Kohle - Erdgas - Petrochem., 29(2):64-69, 1976. 5 refs.

In view of the limits of global crude oil reserves, alternative fuels to power combustion engines are under consideration. Tests have demonstrated that methanol propulsion is possible and offers advantages of increased efficiency and lower pollution. Further improvements can be anticipated from a better adjustment of combustion engines to methanol fuel. Some disadvantages result from lower energy content. Short-term introduction of methanol is out of the question because of the changeover problems involved. An intermediate solution would be the use of methanol/gasoline mixtures. Large-scale testing in this area is presently being performed. The application of methanol still presents a number of unsolved problems; its prospects as a future alternative fuel are considerable.

58172

APTIC NO. 80549

Schrag, M. P. and L. J. Shannon

EVALUATION OF ELECTRIC FIELD FABRIC FILTRATION (FINAL REPORT). Midwest Research Inst., Kansas City, Mo. Environmental Protection Agency Contract 68-02-1324, Task 12, Program Element 1AB012; ROAP/21ADL-029, Rept. EPA-600/2-76-041, 25p., Feb. 1976. 11 refs.

The use of electric fields in fabric filters is evaluated as a means of controlling fine particulate emissions from industrial sources. Theoretical studies of electrified filters are discussed and experimental studies of model filter systems are reviewed. Available theoretical and experimental information indicates that electric fields can improve the collection efficiency of fabric filters. However, the lack of an adequate data base on filter systems suitable for industrial applications precludes a firm judgment on whether electrified fabric filters will be useful for the control of emissions from industrial sources. Possibilities include a conventional bag filter with an electrification addition and a more porous filter medium in an electrified filter system to increase capacity, operate at lower pressure drop, or allow control of difficult sources. Cleaning of an electrified filter or an electrostatically assisted system will probably be more difficult than merely reversing polarity or turning off the field. (Author abstract modified)

58173

APTIC NO. 83028

Sheehan, J. D. and A. Saleem

THE STAUFFER PHOSPHATE FLUE GAS DESULFURIZATION PROCESS. Preprint, 15p., 1976. (Presented at the Air Pollution and Industrial Hygiene Conference, 12th, Air Quality Management in the Electric Power Industry, Austin, Tex., Jan. 30, 1976.)

The Stauffer phosphate flue gas desulfurization process is described. The process involves wet scrubbing and can be divided into three major steps: pretreatment and sulfur dioxide absorption, chemical regeneration and sulfur recovery, and hydrogen sulfide generation. The flue gas to be treated is first cleaned of particulate matter and cooled to its adiabatic saturation temperature through direct contact with water. The cooled, cleaned flue gas is desulfurized by contact with sodium phosphate solution in an absorption tower. The sulfur dioxide-free flue gas is then reheated and discharged to the atmosphere. The sulfur dioxide-laden sodium phosphate liquor from the absorber is pumped to a central plant for regeneration and sulfur recovery. The sulfur recovered from the flue gas is reacted with steam and a hydrocarbon (either coal, oil or natural gas) to produce hydrogen sulfide. Sulfur dioxide reductions from 2000-3000 ppm to less than 50 ppm are feasible based on pilot plant testing. The estimated capital cost of a system serving a 600-megawatt power plant boiler is \$45,000,000 on a turn key basis. The annualized operating costs on a unit basis translate to 3.33 mills/kilowatt-hr without any credit for by-products.

58174

APTIC NO. 81886

Snow, R. H., J. E. Huff, and Werner Boehme

ODOR CONTROL BY SCRUBBING IN THE RENDERING INDUSTRY (FINAL REPORT). Fats and Proteins Research Foundation, Inc., Des Plaines, Ill., Environmental Protection Agency Contract 68-02-1087, Program Element 1AB015, ROAP 21AXM-062, Rept. EPA-600/2-76-009, 219p., Jan. 1976. 28 refs.

Experiments at a rendering plant were conducted to obtain design data for wet scrubbing systems used for odor control. Scrubber performance was assessed by an odor panel and gas chromatographic analysis. Odor removals of 90% per stage were obtained with a fresh alkaline sodium hypochlorite solution used in a three-stage packed-bed laboratory-scale scrubber at the rendering plant. A 2-week test of a plant-scale horizontal spray scrubber handling plant ventilation air showed odor removals of 83%. Outlet odor units averaged 64, while the inlet ranged from 165-2500 odor units. The evaluation of a three-stage packed-bed scrubber to be used instead of an existing incinerator for treating a process air stream containing from 5000-50,000 odor units resulted in an average odor reduction of 85%. (Author abstract modified)

58175

APTIC NO. 83980

Stadelmann, M. and H. R. Waelti

NON-POLLUTING ENERGY GENERATION IN THE DAIRY BERN. (*Umweltfreundliche Energieerzeugung in der Verbandsmolkerei Bern*). Text in German. *Gesundheitstech.*, 10(1):15-16, 1976.

Ecological energy generation in a Swiss dairy operation is presented. It was established that a mixed operation of steam-hot water fueled with natural gas/light oil was the most economical with regard to investment and operational costs. A sterile steam network and a hot steam network were installed, due to the fact that in some processes the steam was in immediate contact with the product while in others, the product was kept separate from the steam cycle. This design required 2 boilers; 1 was fed with part-desalinated water generating heating steam and the other produced sterile heat from wholly desalinated water. Both triple draft-flame tube-fire tube boilers generated a maximum of 10 t/hr of steam, each permitting subsequent attachment of new production apparatus and expansions. Basically, the boilers were powered by natural gas with an optimal consumption of 1800 cu m/hr and with light oil during the winter at peak hours when other consumers needed natural gas. It was deemed commendable that the dairy went to such lengths to assure a clean environment.

58176

APTIC NO. 84252

Stadelmann, M.

NEW GAS HEATING AND ECONOMIC WASTE WATER PURIFICATION SYSTEM. (*Neue Gasheizung und kostengünstiges Abwasserreinigungssystem*). Text in German. *Textilveredlung* (Basel), 11(1):25-28, 1976.

A plant to neutralize alkaline sewage from a cellulose fiber finishing plant by means of flue gas was described. Finishing and dying in the plant required mostly the use of alkalis; their content in the waste water could run to a pH higher than 9. Acid chemicals were added to achieve neutralization although this process was regarded as problematic from the viewpoint of water protection. A Swiss textile mill utilized carbon dioxide in flue gas to neutralize the sewage which took place in 2 steps. In the first step, the mixture of CO₂ and NaOH resulted in the formation of NaHCO₃, and in the second step, of Na₂CO₃. Both constituted a buffer solution of a pH 7.2-8. The solution was stable and could absorb larger quantities of acids or lyes without pH shifts. The mixture of waste water and flue gas could be obtained by injecting waste water into the gas flow, by pumping the gas into the water (only if natural gas was used because it burned cleanly without a residue) or by showering the waste water into the flue gas by way of a channel distribution system. The latter process was chosen because it virtually required no maintenance and ran practically without difficulties. The investment for the waste gas neutralization plant was about \$100,000, operational cost, except power for pumps and ventilators was almost non-existent and lower than chemical neutralization. The demand on the local water purification plant was reduced to half, air was not polluted.

58177

APTIC NO. 83042

Stambaugh, E. P., J. F. Miller, S. S. Tam, S. P. Chauhan, H. F. Feldmann, H. E. Carlton, H. Nack, and J. H. Oxley

THE BATTELLE HYDROTHERMAL COAL PROCESS. Preprint, Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., 17p., 1976. (Presented at the Air Pollution and Industrial Hygiene Conference, 12th, Air Quality Management in the Electric Power Industry Conference, Austin, Tex., Jan. 28-30, 1976.)

The Battelle Hydrothermal Coal Process for the desulfurization of coal is described. The process is capable of extracting up to 99% of the pyritic sulfur in coal and up to 70% of the organic sulfur in coal. There are five major processing steps in the desulfurization procedure: coal preparation, hydrothermal treatment, fuel separation, fuel drying, and chemical leachant

regeneration. The primary end products are clean solid fuel and elemental sulfur which can be marketed or easily stored. Sodium hydroxide and calcium hydroxide appear to be the most promising leachant materials based on extensive laboratory studies. Economically, the process appears to be highly competitive with other processes which are less attractive from an environmental standpoint and plant operation.

58178

APTIC NO. 83044

Statler, Charles W.

MULTI-STREAM COAL WASHING. A SYSTEMS APPROACH FOR THE CONTROL OF SULFUR. Preprint, Pennsylvania Electric Co., Johnstown, Pa., 15p., 1976. 2 refs. (Presented at the Air Pollution and Industrial Hygiene Conference, 12th, Air Quality Management in the Electric Power Industry, Austin, Tex., Jan. 28-30, 1976.)

The multi-stream coal cleaning process (MCCS) for producing low sulfur coal is described. The process can be used by itself or in combination with other techniques and is capable of producing an intensely cleaned fuel in the primary stream having 0.6 lb of sulfur/million Btu as well as a middling fuel suitable for use in existing generating units. A MCCS system developed by the General Public Utility Corporation and the Pennsylvania Electric Company includes a number of innovations to existing multi-stream process technology relating to the following: the extension of the application range of heavy media cyclone equipment to smaller sized coal fractions (from the usual 28 mesh size to 100 mesh); the substitution of full stream electromagnetic separators for drain and rinse screens in the coal circuit for recovering magnetite; the extension of the range of operating specific gravity from 1.4 to 1.3; and the development of a new control system for tighter control of the specific gravity of operation in the nominal 1.3 specific gravity circuit.

58179

APTIC NO. 84039

Takahashi, Yasuro and Hisao Yamamoto

ON GAS FIRING LOW NOX BURNER FOR BOILER. (*Boira yo gasu taki tei NOx bana ni tsuite*). Text in Japanese. *Nenryo oyobi Nensho* (Fuel and Combustion), 43(2):115-121, Feb. 1976. 3 refs.

The Nagasaki Research Institute of Mitsubishi Heavy Industries has introduced a gas-firing low nitrogen oxides burner for reduction of nitrogen oxide generation in boilers, which is a new technical development able to comply with future environmental standards. The gas-firing low NOx burner is configured to have three sectioned air passages with nozzles at the top of each section. In the air passage, an air/fuel mixer is installed so that in the center passage the air/fuel mixture with a high concentration of fuel will be prepared, while an air/fuel mixture with a low concentration of fuel will be prepared in the other passages. The characteristic of burner A with a capacity 4,000,000 kcal/hr and burner B with a capacity 28,000,000 kcal/hr were determined by tests using a combustion test furnace, a 2 tons/hr, and a combustion test furnace, 8 tons/hr respectively. The air ratio of the air/fuel mixture in the center passage was 0.6 to 0.7 and in the other passages was 1.4 to 1.5. Marketable propane and methane gas were used as fuels. These low NOx burners reduce NOx generation to 20 ppm with an appropriate amount of gas recirculated regardless of the high air temperature, and reduce NOx to 40 ppm without recirculated exhaust gas if air is at atmospheric temperature.

58180

APTIC NO. 80543

Turner, James F., III

IRON FOUNDRY CUPOLA RECUPERATIVE EMISSION CONTROL DEMONSTRATION (FINAL REPORT). Flynn and Emrich Co., Baltimore, Md., Environmental Protection Agency Contract 68-02-0286, Program Element 1AB013; ROAP 21ARO-002, Rept. EPA-600/2-76-004, 52p., Jan. 1976. 5 refs.

CONTROL METHODS

58186

Results are given from a project intended to demonstrate the use of a dry, solid-media heat exchanger for the production of hot blast air for the cupola as an integral part of the air pollution control system. Economic advantages in the form of reduction in fuel costs, operating costs, and air pollution equipment costs were expected. The system was never made operational due to problems in interfacing the cupola, heat exchanger, and air pollution control systems. Underestimation of the exhaust gas volume resulted in undersized ductwork. This resulted in a larger than expected pressure drop allowing a portion of the exhaust gases to escape through the charging door. The undersized duct also resulted in a high gas velocity. The combustion of the carbon monoxide content of the gas occurred, therefore, beyond the refractory lined duct and caused damage to the steel ductwork. Another error occurred in the placement of the cross-over ducting from the cupola to the heat exchanger. The distance was insufficient to allow combustion to occur even if the ductwork were of the proper dimensions. The results of the work on the computer model are presented, and the test equipment selected is described. (Author abstract modified)

58181

APTIC NO. 81883

Varga, John, Jr.

CONTROL OF RECLAMATION (SINTER) PLANT EMISSIONS USING ELECTROSTATIC PRECIPITATORS (FINAL REPORT). Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract 68-02-1323, Program Element 1AB015, ROAP 21AQR-042, Task 32, Rept. EPA-600/2-76-002, 81p., Jan. 1976. 59 refs.

The use of electrostatic precipitators to control reclamation (sinter) plant emissions is reviewed. The emissions associated with sinter plant operations are primarily particulates that become entrained in the combustion air as it is drawn through the sinter mix into the windbox. Electrostatic precipitators are the principal means for controlling emissions from the windboxes of sinter machines and are found in 22 of 45 reclamation plants throughout the United States. Precipitator collection efficiency decreases as sinter basicity increases, and the increased use of high-basicity sinter makes control of sinter plant emissions difficult. Design specifications are outlined for a proposed wet electrostatic precipitator installation at a large modern sinter plant.

58182

APTIC NO. 81900

Varga, John, Jr.

CONTROL OF STEEL PLANT SCARFING EMISSIONS USING WET ELECTROSTATIC PRECIPITATORS (FINAL REPORT). Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract 68-02-1323, Program Element 1AB015, ROAP 21AQR-042, Task 32, Rept. EPA-600/2-76-054, 37p., March 1976. 40 refs.

Design information pertaining to wet electrostatic precipitators used for the control of iron oxide fume generated during steel plant scarfing operations is presented. Scarfing is a process that is used to remove surface defects from steel slabs, blooms, and billets and results primarily in iron oxide emissions along with small amounts of carbon dioxide and/or carbon monoxide. Although there is no information in the published literature pertaining to the design and operation of scarfing machine wet electrostatic precipitators, data supplied by some steel companies for wet electrostatic precipitators installed at their plants is presented. No major operating or maintenance problems are reported for such installations. Operating and maintenance costs for a 40-inch blooming mill and a 45 by 90-inch slabbing mill are reported to be \$0.009/ton or less.

58183

APTIC NO. 83434

Williams, John E.

A SUMMARY OF EPA EXPERIENCE RELATED TO FGD CORROSION PROBLEMS AND SOLUTIONS. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., I.G.C.I., and N.A.C.E., 24p., 1976. (Presented at the Resolving Corrosion Problems in Air Pollution Control Equipment Seminar, Atlanta, Ga., Jan. 20-23, 1976.)

Environmental Protection Agency experience with flue gas desulfurization corrosion problems are reviewed, with particular emphasis on an on-going corrosion study being conducted at a lime/limestone test facility. The most severe damage in scrubbers occurred in areas exposed to the following: humidified stack gas containing fly ash, carbon dioxide, oxygen, and sulfur dioxide at elevated temperatures and high velocity; gas and slurry discharging at high velocity from the venturi; and gas and mist leaving the absorber. Metals covered by limestone/fly ash deposits were not eroded but were subject to corrosion of the concentration cell type. Neoprene-lined towers, ducts, piping, and tanks as well as rubber-coated test specimens were durable. Plans for further studies are presented along with results from other test programs.

58184

APTIC NO. 83647

Yokoyama, Akio

STACK GAS DESULFURIZATION FACILITIES OF PLATE GLASS MELTING FURNACE. (Garasu yoyuro no haen datsuryu sochi). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 43(2):122-126, Feb. 1976.

Three types of stack gas desulfurization systems designed for plate glass melting furnaces are described. These systems are all used in the various Asahi Glass plants; performance data are presented. The smoke and soot discharged from the plate glass melting furnaces consists of sub-micron fumes, mainly sulfate of soda. The Asahi semi-dry stack gas desulfurization system, the evergreen wet type stack gas desulfurization system, and the fan-scrubber type stack gas desulfurization system with caustic soda absorption or salt water absorption are described. By June 1973, 13 plate glass melting furnaces out of a total of 15 used one of these systems. All the systems achieved above 90% desulfurization and reduced the concentration of soot and dust and sulfur oxides after treatment to less than 30 mg/N cu m and 110 ppm, respectively.

58185

APTIC NO. 81532

Soviet-American Working Group on Air Pollution Prevention Methods

IMPROVEMENT OF WET AND DRY SINTERING GAS PURIFICATION SYSTEM. Iron Steel Ind. Suppl. Proc. 1st Conf. 1976. Translated from Russian, 15p.

Design and operating data for venturi scrubbers installed at sintering and roasting plants in the USSR are presented. Efficient dust trapping is ensured at a 55-65 m/sec gas flow rate in the throat of the venturi tube and at a specific venturi tube water consumption rate of 0.5-0.1 l/cu m of gas. The final dust content in the purified gas does not exceed 0.03-0.08 g/cu m. The use of large wet dust traps considerably reduces the dimension of the gas scrubbers and their cost in addition to simplifying their design and maintenance. The internal surfaces of the venturi tubes and scrubbers are lined with a ceramic and cast stone plate for protection from abrasive and corrosive wear.

58186

APTIC NO. 82760

Environmental Protection Agency, Ann Arbor, Mich., Technology Assessment and Evaluation Branch

MINI TURBO-CHARGER AIR BLEED: EVALUATION ON A LIGHT DUTY GASOLINE POWERED VEHICLE. Preprint, 13p., Jan. 1976. 1 ref.

A Mini Turbo-Charger air bleed device installed on a 1971 Ford Galaxie with a 351-cubic inch engine and automatic

transmission was tested for its effect on exhaust emissions and fuel economy. The Mini-Turbo-Charger is an engine vacuum actuated valve which allows air to bleed into the intake manifold via the positive crankcase ventilation system. The device is installed in the PCV line between the PCV valve and the carburetor. Hydrocarbon, carbon monoxide, and nitrogen oxide composite mass emissions (1975 Federal Test) with the device installed were 3.21, 8.24, and 2.80 g/mi, respectively, as compared to baseline values of 2.74, 20.4, and 3.60 g/mi, respectively. Fuel economy was decreased by about 4%. The changes in exhaust emission levels were probably due to the lean misfire condition established by the device.

58187

APTIC NO. 83435

Environmental Protection Agency, Ann Arbor, Mich.,
Technology Assessment and Evaluation Branch

AN EVALUATION OF THE ELECTRO-DYN SUPER
CHOKE. *Preprint*, 9p., Jan. 1976. 1 ref.

Exhaust emission and fuel economy tests, were performed on a 1971 Ford Galaxie (351-cubic inch engine) equipped with an Electro-Dyn Super Choke. The choke is supposed to reduced fuel consumption. A bimetallic spring which controls the opening of the choke blade is electrically heated, and the voltage supplied to the heating element is regulated by a temperature sensor that is mounted on the engine block. Negligible effects on exhaust emissions and fuel economy were experienced with a first choke installation, and a second installation resulted in reduced composite carbon monoxide emissions (19%) and increased nitrogen oxide emissions (12%) during the Federal Test Procedure. No significant change in hydrocarbon emissions or fuel economy occurred during the second test.

1975

58188

APTIC NO. 79605

Abaseev, V. K. and R. A. Zabairova

CATALYTIC PURIFICATION OF GASES GENERATED
IN POLYIMIDE FOIL MANUFACTURE.
(Kataliticheskiy metod obezvezhivaniya otkhodyashchikh
gazov pri proizvodstve poliamidnoy plenki). *Text in Russian. Plast. Massy*, no. 5:34-35; 1975. 4 refs.

The catalytic oxidation of dimethylformamide, generated in polyimide foil manufacture, was studied. In a first step, polyimide and other nitrogen-containing organic substances are oxidized to nitrogen oxides by means of NIOGAZ-7D catalysts composed of oxides of copper, chromium, and vanadium, after which the nitrogen oxides generated are reduced by means of the same catalyst in a second stage in the presence of oxygen and ammonia. The optimal conditions were determined to be a bulk speed of 10,000/hr, a temperature of 320 C, and a nitrogen oxides to ammonia ratio of 1:1. Higher bulk speeds and temperatures lead to the oxidation of ammonia. The NIOGAZ-7D catalysts was found to be universally applicable for the oxidation of dimethylformamide, trimethylamine, monoethanolamine, acetonitrile, pyridine, and nitrobenzene.

58189

APTIC NO. 82408

Abello, Lawrence

CONVERSION DEVICE ENABLING A GASOLINE ENGINE TO BE FUELED WITH HYDROGEN. (Canadian Jesuit Missions, Toronto (Canada)) U. S. Pat. 3,897,757. 7p., Aug. 5, 1975. 8 refs. (Appl. Feb. 16, 1973, 7 claims).

A conversion device enabling a gasoline engine to be fueled with hydrogen is described. The mechanism allows a simple gasoline engine to be converted to run using hydrogen as a fuel by the introduction of a pulse of H₂ during the intake stroke. The mechanism is such that an engine may use either fuel at will but preferably simple changes to the cylinder head allow an engine to be converted into a high compression engine using H₂ alone because of the greater efficiency. Prior art devices require such elaborate modifications as to be virtually specially built engines. (Author abstract modified)

24

AIR POLLUTION ABSTRACTS, JUNE 1976

58190

APTIC NO. 81944

Achorn, Frank P., Hubert L. Balay, and David G. Salladay

FLUORINE RECOVERY FROM SUPERPHOSPHATE PLANTS. *Preprint, American Chemical Society, Washington, D. C.*, 31p., 1975. 5 refs. (Presented at the American Chemical Society Meeting, Chicago, Ill., Aug. 24-29, 1975.)

Information concerning some of the commercial practices for the recovery of fluorine from superphosphate plants is presented. Possible uses for such recovered F are also discussed in terms of economics and technology. The gas from normal superphosphate plants is usually scrubbed in an impingement scrubber or the more modern venturi type. Concentrated superphosphate plants are also discussed. Plant tests show that water scrubbing in either impingement or venturi scrubbers removes F, in the form of silicon tetrafluoride, effectively from the exit gases of superphosphate plants. Usually the venturi scrubber is more efficient and can utilize weak hexafluorosilane (H₂SiF₆) as a scrubbing medium to remove F effectively from superphosphate dens. A major problem with the recovery of F from superphosphate plants is disposal of the by-products from these systems.

58191

APTIC NO. 82076

Acres, Gary James Keith, Alan Sydney Darling, Laurence Alfred Heathcote, Eric Shutt, and Gordon Leslie Selman

CATALYST. (Johnson, Matthey and Co., Ltd., London (England)) U. S. Pat. 3,915,898. 4p., Oct. 28, 1975. 9 refs. (Appl. Aug. 9, 1972, 3 claims).

An arrangement of catalytic gauzes for catalyzing a reaction between two or more gases when passed through the gauzes is described. In conventional arrangements of catalytic gauzes, significant quantities of platinum and rhodium are volatilized from the gauzes, carried away in the gas stream, and lost. The losses are reduced in this arrangement by replacing some of the gauzes on the downstream side of the array by gauzes woven from non-precious metal or from material which is less easily volatilized and carried away by the gases. Stainless steel gauzes are suitable for use in conjunction with 10% rhodium-platinum gauzes for the catalytic oxidation of ammonia gas.

58192

APTIC NO. 83763

Adachi, Nanao

CATALYSTS FOR THE TREATMENT OF DISCHARGED GASES. (Haikigasu shoriyo shokubai). *Text in Japanese. (TDK Electronics Co., Ltd. (Japan)) Japan. Pat. Sho 50-11873*. 4p., May 7, 1975. 3 refs. (Appl. Oct. 8, 1970, 1 claim).

Catalysts which consist of sintered bodies are described. The material contains ferric oxide and at least one of the oxides of the transition metals and normal metals. Thus, 0.3 wt% vanadium pentoxide was added to a mixture of 55 molar% ferric oxide, 25% manganese oxide, 15% zinc oxide, and 5% copper oxide. The mixture was compacted at a pressure of 100 kg and sintered for about 2 hr at about 1350 C. An X-ray diffraction study of the sintered product showed the presence of spinell structure. The sintered material was then crushed to grains, 2-5 mm in diameter. A glass tube 15 mm in diameter and 50 cm long was filled with 10 cc of the crushed grains. When a discharged gas containing 1% carbon monoxide and 500 ppm hydrocarbons was passed through this tube at a space rate of 10,000/hr, hydrocarbons were eliminated almost completely at above 400 C and CO was removed almost completely at above 500 C. A mixture of CuO, manganese oxide, and Fe₂O₃ in a molar ratio of 1:4:5 was also an excellent catalyst when treated by this process. The catalyst is stable at 200-1100 C.

58193

APTIC NO. 83213

Adams, Leon M. and Henry F. Hamil

METHOD AND APPARATUS FOR ODOR ABATEMENT. (Corn Refiners Assoc., Inc., Washington, D. C.) U. S. Pat. 3,875,034. 8p., April 1, 1975. 7 refs. (Appl. Dec. 11, 1972, 10 claims).

CONTROL METHODS

58200

A method and apparatus for abating the odor of a gaseous stream containing one or more odorous organic contaminants is described. The stream is subjected to a silent electric discharge which causes a partial decomposition of the contaminants to an odor abated form. The silent electric discharge is established in a reaction chamber to which the gaseous stream is applied. Unlike in other processes, this process does not require the use of an absorber or solvent material. (Author abstract modified)

58194

APTIC NO. 76255

Adelman, H. G. and R. K. Pefley

METHANOL AS AN AUTOMOTIVE FUEL. Preprint, Santa Clara Univ., Santa Clara, Calif., Dept. of Mechanical Engineering, 23p., 1975. 15 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 80th, Boston, Mass., Sept. 7-10, 1975.)

The air pollution aspects of methanol as an automotive fuel are discussed. Unburned fuel emissions from methanol are primarily methanol, which is not a hydrocarbon but an oxygenated hydrocarbon species. Unburned fuel emissions are lower for methanol than for gasoline. Carbon monoxide levels are also lower for methanol. While 98 to 99% of the nitrogen oxides emissions from gasoline fueled engines are nitric oxide, up to 50% of other NO_x compounds occurred in the exhaust of methanol fueled automobiles. Methanol's lean flammability limit allows operation at low NO_x levels. Aldehyde levels must be reduced for methanol to be superior in all emission areas. This can be done by adding 5 to 15% water to the fuel or by increasing the compression ratio. Methanol has a better indicated specific energy consumption than gasoline or isooctane.

58195

APTIC NO. 83116

Afanasyev, I. I., L. K. Saplinov, G. N. Nikolina, Y. I. Pirogov, A. V. Arkhipov, and I. P. Zaverkin

FOAM GENERATORS FOR THE LOCALIZATION OF DUST EMISSION SOURCES IN ORE-DRESSING PLANTS. (Penogeneratory dlya lokalizatsii istochnikov pyli na fabrikakh rudopodgotovki). Text in Russian. Metallurg, vol. 10:12-13, Oct. 1975.

Suppression of dust with the use of foam was investigated industrially. A complex of four foam generators was employed to localize dust emission sources during the loading of limestone and concrete block. When a hammer reverse crusher was used, the greatest amount of dust was produced without load. Under these conditions, foam decreased the intensity of dust production tenfold, and pollution of the work environment did not exceed permissible limits.

58196

APTIC NO. 83661

Aghassi, William J. and Paul N. Cheremisinoff

NOX CONTROL IN CENTRAL STATION BOILERS. Power Eng., 79(6):46-48, June 1975.

Methods for controlling nitrogen oxides in central station boilers are discussed. There are three methods of cutting down on NO_x emissions: water or steam injection, flue gas recirculation, and overfire air, also known as two-stage combustion. While nitric oxide reduction can be as great with water injection as with other methods, the high loss in thermal efficiency in times of rising fuel prices makes costs prohibitive. Flue gas recirculation is easier to control than overfire air, because only one set of dampers and fans is operated. This method can be easily applied to coal firing. It produces the lowest NO_x levels of any practical abatement method in boilers. The capital cost is much higher than that for overfire. Consolidated Edison has achieved a 60% reduction on oil firing, and a 73% reduction on gas firing using the overfire air method. The method cannot be used with coal, and is much harder to control than gas recirculation. Operator skill is an important factor in any of these methods.

58197

APTIC NO. 83057

Ahuja, R. D. and D. C. Rastogi

INCINERATION - A WASTE DISPOSAL TECHNIQUE.

Chem. Age India, 26(1):19-22, Jan. 1975. 4 refs.

The use of incineration as a waste disposal technique is discussed. Incinerators can be used to efficiently decompose fumes, liquid effluents, and sludges. Heat recovery systems can be combined with incinerators for improving operating economics. Maximum operating flexibility can be achieved by using a dual fuel support burner with a wide turndown ratio. The design of an incinerator for the disposal of waste chlorinated hydrocarbons is outlined, with particular emphasis on features designed to prevent acid corrosion. Flue gases containing hydrogen chloride pass into a direct quench system and subsequently to an acid recovery unit.

58198

APTIC NO. 82019

Aine, Harry E.

EXHAUST EMISSION CONTROL MEANS FOR INTERNAL COMBUSTION APPARATUS. (Assignee not given.) U. S. Pat. 3,903,694. 9p., Sept. 9, 1975. 13 refs. (Appl. May 16, 1973, 19 claims).

An exhaust emission control system for removing smog producing constituents from the exhaust gases of internal combustion engines is described which employs a membrane gas separator disposed in gas communication with the flow of exhaust gases at essentially atmospheric pressure. The permeability of the membrane is substantially less for permanent gases than it is for unburned hydrocarbon gaseous smog producing constituents in the exhaust. The gas separator causes unburned hydrocarbons and other smog producing compounds to go into solution with the membrane material and to diffuse from the membrane material into a stream of fresh air at substantially atmospheric pressure. The stream is then fed back to the combustion chamber or to an afterburner for the completion of combustion. A relatively large area of membrane material is provided in a relatively small volume by pleating or folding the membrane. Alternatively, a large area is provided in a small volume by bonding together adjacent sheet portions of membrane to provide a honeycomb of alternating exhaust and fresh air gas passages. (Author abstract modified)

58199

APTIC NO. 83663

Albrecht, P. F. and J. A. Lieberman

RELIABILITY OF FLUE GAS DESULFURIZATION SYSTEMS. Power Eng., 79(6):56-59, June 1975.

The reliability of full scale flue gas desulfurization systems (FGD) for power plants was surveyed. As of mid-1974 there were 68 full scale FGD installations which were operational, committed, or in advanced planning. The average annual growth rate from 1971 through 1977 is scheduled to be 93% compound. The Environmental Protection Agency's estimate of FGD capacity needed to meet air quality goals, an industry estimate of system manufacturing capability, and a projection line of actual FGD capacity on line as now scheduled are illustrated. The method most commonly used is scrubbing with lime or limestone introduced directly into the scrubber circuit. Either lime or limestone can be used as the absorbent. Availability of most of the operational FGD systems is low, because of repairs, modifications, and other reasons. The actual operating experience, on the average, might be 25% of total time since startup.

58200

APTIC NO. 82378

Alcock, Leslie and James Ford

CATALYTIC REACTORS. (British Petroleum Co., Ltd., London (England)) U. S. Pat. 3,897,220. 4p., July 29, 1975. 3 refs. (Appl. Dec. 27, 1973, 3 claims).

A moveable grid system which allows for the rapid replacement of catalysts in fixed bed reactors is described. The system which permits the removal of the catalyst through the

normal outlet opening consists of a cylindrical or rectangular grid and a shield adjacent the grid into which the grid can fit. A means for moving the grid into and out of the shield is also provided, preferably external to the reactor. The grid system is particularly suitable for large reactors requiring relatively frequent catalyst replacement, e.g., residue desulfurization reactors. (Author abstract modified)

58201

APTIC NO. 83976

Alekhnovich, A. N., G. G. Zyryanov, O. N. Degtev, and N. N. Skerko

OXIDES OF NITROGEN EMISSION FROM BOILER PLANTS WITH WET-TYPE SLAG REMOVAL USING KUZNETSK COALS. (Vybros okislov azota kotloagregatami szhidkim shlakoudaleniem pri szhiganii kuznetskih ugley). Text in Russian. *Elektr. St. (Moscow)*, no. 6:17-19, 1975. 3 refs.

The process of nitrogen oxides emission from boilers at power stations was studied. The investigations were carried out on boilers with wet type slag removal that use kuznetsk coals. Measurements based on linear-calorimetric methods showed that the concentration of NOx at exploitation conditions was 0.025-0.039% (between 0.042 and 0.05% when the Griess-Ilosvay method was used). The temperature of the process depends on the amount of surplus air; when the surplus was 1.23% in the amount of the vented gas increased from 0.022% to 0.04% (applying Griess's method). When the heat of combustion increased from 4285 to 5960 kcal/kg, the amount of NOx increased from 0.042 to 0.052% (Griess's method) (from 0.032% to 0.044% according to the linear-calorimetric method). The quality of fuel determines the amount of NOx emission. Varying the quality of the fuel, it was found that the variation of NOx was 0.008% to the volume. Two parameters, the temperature of combustion and the total surplus of the air, determine the level of NOx emission.

58202

APTIC NO. 84459

Alfredsson, P. O.

FLUE GAS DESULPHURIZATION THROUGH THROW-AWAY PROCESSES. Preprint, *Economic Commission for Europe*, 12p., 1975. (Presented at the *Desulphurization of Fuels and Combustion Gases Seminar*, 2nd, Washington, D. C., Nov. 11-20, 1975.)

Throw-away processes for flue gas desulfurization are discussed. Throw-away systems include: lime scrubbing, limestone scrubbing, dual alkali, dilute sulfuric acid scrubbing, limestone furnace injection, sea water scrubbing, and ammonia flue gas conditioning. Specific systems operating in various parts of the world are described and a cost comparison is included.

58203

APTIC NO. 82910

Allen, John E.

CONTROL OF POLLUTION BY RECYCLING SOLID PARTICULATE STEEL MILL WASTES. (Ferro-Carb Agglomeration Ltd., Inc., Chicago, Ill.) U. S. Pat. 3,870,507. 4p., March 11, 1975. 5 refs. (Appl. May 14, 1973, 3 claims).

A process for controlling pollution in steel mill operations by recycling the solid particulate wastes is described. Solid wastes, such as blast furnace flue dust, basic oxygen furnace dust, mill scale, coke braise, and fluxes, which contain iron, iron oxides, carbon, and other constituents, are briquetted with 3-10% hydrocarbonaceous binder of the total dry weight of the waste fines. The raw briquettes are treated with an oxygen containing gas at 350-600°C to selectively react with the hydrogen in the binder to obtain strong briquettes which can be fed back into the Fe or steelmaking processes as a source of Fe and/or C. In the past, the disposal of the particulates, generally by the sintering process, was a source of pollution and much of the C in the waste was consumed. (Author abstract modified)

58204

APTIC NO. 82022

Altekruse, Richard D.

METHOD FOR DESTRUCTION OF PYROTECHNIC WASTE. (Olin Corp., New Haven, Conn.) U. S. Pat. 3,903,814. 4p., Sept. 9, 1975. 4 refs. (Appl. Nov. 13, 1974, 6 claims).

A method for the controlled incineration of pyrotechnic waste material is described that eliminates smoke and fume emissions. The waste material is burned in a closed incinerator, and the smoke and fumes are cleaned by conventional methods (e.g., scrubbing). The incinerator is lined with conventional refractory material and has an opening in its top through which charges of the pyrotechnic material are introduced. The burning is in a step-wise fashion, i.e., a charge of predetermined weight is dropped into the incinerator and is incinerated as it falls through the incinerator. The next charge to be burned is dropped into the incinerator only after the preceding charge is completely burned. The bottom of the incinerator is covered with incandescent coke which provides the heat needed to ignite the charges.

58205

APTIC NO. 82881

Altmann, Berton G.

DEVICE FOR COMBUSTION OF GASEOUS WASTES. (Assignee not given.) U. S. Pat. 3,875,874. 5p., April 8, 1975. 4 refs. (Appl. May 28, 1974, 4 claims).

A device for the complete combustion of gaseous waste products is described. It consists of a refractory chamber divided by means of a refractory wall into interconnecting first and second compartments which have an increasing internal cross section from the point of gas entry to gas exit. Air is introduced in controlled amounts into the stream of gaseous wastes as it traverses the length of the chamber via the first and second compartments. Supplementary heating means are provided in the first compartment to raise the temperature above the point of combustion of the gas/air mixture whenever required. Other devices are unable to provide adequate and controlled air levels and to maintain proper temperatures during the length of time required for combustion. They are unable to provide low enough air velocities to permit solid materials to drop out and remain out of the effluent stream. (Author abstract modified)

58206

APTIC NO. 83233

Amerkhanov, R. A. and V. A. Shilov

EFFICIENCY OF DUST SEPARATORS IN COTTON-SEED PROCESSING PLANTS. (Effektivnost pyloochistnogo oborudovaniya pri pererabotke khlopkovykh semyan). Text in Russian. *Maslo-Zhir. Prom.*, vol. 10:44-46, Oct. 1975. 2 refs.

The conclusions of studies aimed at improving the efficiency and reliability of dust separators in cotton-seed processing are reviewed. Polydispersed dust, consisting of organic and mineral particles, should not exceed 4 mg/cu m in a working area, but investigations have shown levels 5-6 times higher. High dust concentrations in processing plants are caused primarily by outdated technological equipment. Air inflows reaching 30% are one of the causes of unsatisfactory dust collection. A double-hinged system of air cleaning should be introduced, with the second phase involving the removal of very fine particles from the air.

58207

APTIC NO. 81759

Anderson, Conroy D., David W. Carlson, Stephen M. Oleck, and William A. Stover

CATALYST REACTOR FOR OXIDIZING CARBON MONOXIDE AND HYDROCARBONS IN GASEOUS STREAM. (Mobile Oil Corp., New York) U. S. Pat. 3,914,377. 7p., Oct. 21, 1975. 9 refs. (Appl. July 7, 1972, 7 claims).

A dual-bed catalytic reactor system for simultaneously reducing hydrocarbon and carbon monoxide emissions from automobile exhaust is described. The first bed of the system consists of 7-20 wt% of copper oxide and 0.01-5 wt% of palladium. The copper oxide and palladium are co-impregnated on an inorganic oxide support consisting of at least 50 wt% of alumina. The second bed of the system consists of 0.01-5 wt% of palladium supported on a porous inorganic oxide support. (Author abstract modified)

58208

APTIC NO. 82661

Anderson, Robert E.

REMOVAL OF SO₂ FROM FLUE GAS. (Diamond Shamrock Corp., Cleveland, Ohio) U. S. Pat. 3,879,521. 6p., April 22, 1975. 3 refs. (Appl. Jan. 2, 1973, 5 claims).

A process for removing sulfur dioxide from flue gas by scrubbing with an alkaline solution is described. The absorbed sulfur salts are removed with a weak base ion exchange resin. On exhaustion, the resin is regenerated with an ammoniacal solution and the effluent treated with lime to precipitate insoluble S salts and free ammonia. The liberated NH₃ is recycled as a resin regenerant. In conventional systems, insoluble calcium sulfite is formed which leads to considerable scaling of the scrubbing equipment. (Author abstract modified)

58209

APTIC NO. 82971

Andersson, Per-Erik and Einar Horntvedt

METHOD AND APPARATUS FOR OXIDIZING SULPHIDE-CONTAINING AQUEOUS SOLUTIONS. (Svenska Cellulosa Aktiebolaget, Sundsvall (Sweden)) U. S. Pat. 3,888,967. 5p., June 10, 1975. 5 refs. (Appl. Feb. 9, 1973, 1 claim).

The unwanted production of hydrogen sulfide is prevented by effecting the oxidation in the presence of finely divided active carbon and with vigorous stirring. The sulfite sulfur is converted into non-volatile sulfur compounds such as thiosulfate and/or sulfate or sulfur. (Author abstract modified)

58210

APTIC NO. 83291

Ankersen, Borge Richard

WASTE DISPOSAL AND ENERGY RECOVERY REACTOR APPARATUS AND METHOD. (Ankersen Resource Systems, Inc., Pontiac, Mich.) U. S. Pat. 3,884,161. 13p., May 20, 1975. 8 refs. (Appl. Sept. 17, 1973, 9 claims).

A high intensity reactor and reaction process for the pollution free disposal of all types of organic waste materials generated by a modern industrial and residential community is described. The apparatus consists essentially of a main reactor chamber in elongated horizontal form having a plurality of top covers which may be opened for receiving solid waste. A multiplicity of air injection nozzles is located at the bottom for injecting high velocity air along with spaced nozzles for feeding waste liquid fuels for aiding and supporting combustion of the waste. This is a new type of thermal reactor which is capable of handling all types of waste materials without any prior preparation or processing such as separating, sorting, or shredding. The reactor is able to function as a very high intensity combustion unit simultaneously with being a high energy wet scrubber at temperatures approaching 3000 F, which is a significant improvement over the prior art. (Author abstract modified)

58211

APTIC NO. 83589

Ankersen, Borge Richard

WASTE DISPOSAL AND ENERGY RECOVERY REACTOR APPARATUS AND METHOD. (Ankersen Resource Systems, Inc., Pontiac, Mich.) U. S. Pat. 3,884,163. 15p., May 20, 1975. 11 refs. (Appl. Sept. 17, 1973, 14 claims).

A waste disposal and energy recovery reactor apparatus and method are provided for pollution free disposal of all types of organic waste materials with the continuous recovery of the reusable resources in the waste material. The apparatus con-

sists essentially of a multiplicity of reactor chambers connected at a vertical angle to a return gas flue and having top covers which may be opened for receiving solid waste. A multiplicity of air injection nozzles are provided for injecting high velocity air into the chambers. Spaced nozzles are provided for feeding waste liquid fuels for aiding and supporting combustion of the waste. Unlike other reactors, this reactor: can function as a high energy wet scrubber at temperatures approaching 3000 F, is capable of burning a very large number of different products simultaneously and completely eliminates the need for storing any amount of solid waste or refuse materials on the property or in separate storage facilities prior to being processed. (Author abstract modified)

58212

APTIC NO. 82148

Ansdale, Richard Franz Karl

STARTING OF DIESEL ENGINES AND MIXTURE-COMPRESSION INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,911,890. 7p., Oct. 14, 1975. 4 refs. (Appl. Dec. 18, 1973, 5 claims).

A method for starting diesel engines and mixture compressing internal combustion engines is described. Reliable starting is greatly facilitated by providing a further ignition device arranged at each mixture forming point of the induction system to initiate combustion of the fuel injected at the mixture forming point. The induction system is constructed to permit free progression of the combustion from the point of injection towards the associated working chamber and substantially complete combustion of all the fuel in the fuel and air mixture. The use of this preheating system prior to the starting of the engine facilitates the subsequent starting of the engine. The resultant flow of hot gases through the engine exhaust system is available for preheating a thermal reaction exhaust purifier with which the engine may be equipped.

58213

APTIC NO. 80332

Aoi, K.

DUAL PURPOSE APPARATUS OF AIR CONDITIONER AND EXHAUST GAS FOR AUTOMOBILE. (Jidosha touno reibo sochi ken haikigasai seijoki). Text in Japanese. (Assignee not given.) Japan. Pat. Sho. 50-3537. 4p., Feb. 6, 1975. (Appl. Oct. 5, 1970, 3 claims).

A dual purpose air conditioner and exhaust gas cleaner for automobiles is described. Due to adiabatic expansion of the exhaust gas, moisture condenses around small particles in the gas. Injurious particles can be entrained by this condensation. The efficiency of condensation is greater, especially in the summer, if the temperature of the adiabatic expansion system is sufficiently low. Suitable temperature conditions can be obtained with chilled air from an air conditioner. An air conditioner which is operated by vaporization of a lithium bromide solution containing ammonia and hydrogen gas has been developed. Since vaporization of the solution is by the heat of the exhaust gas, there is less energy loss to the engine and battery.

58214

APTIC NO. 79601

Aoi, Tsuyoshi

EXHAUST GAS PURIFIER OF AUTOMOBILE. (Jidosha nado no haiki gasu seijo sochi). Text in Japanese. (Assignee not given.) Japan. Model Util. Sho 50-20191. 3p., June 19, 1975. 2 refs. (Appl. Aug. 26, 1970, 1 claim).

An air purifier for the removal of sulfur dioxide, tetraethyl lead, nitrogen dioxide, and carbon particles in automotive exhaust gas is described. The cylindrical air purifier has a separation chamber connected to the exhaust gas inlet tube. Large particles in the exhaust gas were removed in the chamber by adiabatic expansion caused by a horizontal cyclone. The resulting gas was led to an expansion chamber through a gas path. The gas then passed through two metal plates with a number of holes to a collecting chamber filled with glass wool or stainless steel wool. The two metal plates

formed a condensing chamber in which the moisture condensed and was separated from the gas. The gas leaving the first collecting chamber passed through a second condensing chamber, a second collection chamber, then a third condensing chamber and a third collecting chamber. Harmful gases and particles were removed in the three collection chambers.

58215

APTIC NO. 83198

Aoki, Toshimitsu

MULTI-HOLE PLATE SCRUBBER. (*Mezara shiki sen-joto*). Text in Japanese. Ebara Jiho (Ebara Times), no. 93:68-70, 1975.

A multi-hole plate scrubber (wet-type dust collector) developed by the Ebara Co. jointly with the Nippon Light Metal Co. is described. This scrubber was developed originally in 1972 for aluminum electrolysis factories, to collect waste hydrogen fluoride (HF) gas, but is now being used in steel refineries, stack desulfurization installations, and ceramic industries. Treatment capacities ranged from 800 cu m/min to 350,000 N cu m/hr. Temperatures ranged from 30 C to 160 C. Sodium hydroxide solution is used to absorb HF, sulfur dioxide, and sulfur trioxide gases. Absorption is made effective by thorough gas-liquid contact by the following means: droplets falling through the multi-hole plate; liquid films, stretched over the holes; gas passing through the films; wet-wall effect by the honeycomb zone. Mist accompanying the treated gas is removed by means of an eliminator, and emitted into the atmosphere. Calcium and dust deposition from the industrial water used in the water supply can adversely affect the effectiveness of the installation. An annual or semi-annual maintenance check is recommended.

58216

APTIC NO. 82934

Aoyama, Mitsugu

DUST AND MIST COLLECTOR. (*Niho Jescal Industry Co., Ltd. Tokyo and Mitsugu Aoyama, Fifu-ken (Japan)*) U. S. Pat. 3,880,623. 8p., April 29, 1975. 4 refs. (Appl. July 6, 1973, 5 claims).

A dust and mist collector is described which separates and collects airborne contaminated particulates. Unlike other collectors, this collector eliminates contaminated material ranging from a molecule grade of 0.001 micron to a grain grade of 1300 micron. A saturated water vapor is used as a collecting medium and a contaminated material is separated and eliminated by growth of water vapor molecules including contaminated material as a nucleus.

58217

APTIC NO. 82396

Aquino, Charles F. and Melvin F. Sterner

SUPPLEMENTAL FUEL SYSTEM FOR EXHAUST GAS RECIRCULATING SYSTEM. (*Ford Motor Co., Dearborn, Mich.*) U. S. Pat. 3,903,859. 7p., Sept. 9, 1975. 4 refs. (Appl. Feb. 4, 1974, 9 claims).

An internal combustion engine exhaust gas recirculating system is described, in which a small amount of additional fuel is added to the intake manifold during the recirculation of exhaust gases. The carburetor is supplied with an air channel connected to the engine intake manifold past a movable valve that opens the channel only when exhaust gases are being recirculated into the engine so that engine driveability is improved. The valve is sensitive to the movement of a second valve controlling the recirculation of the exhaust gases as a function of throttle valve movement. (Author abstract modified)

58218

APTIC NO. 82864

Araki, Kunio and Juji Honda

OXIDATION, DECOMPOSITION, AND REMOVAL OF ODOROUS ELEMENTS BY ZEOLITE ROCK. (*Zeoraitogan ni yoru akushu seibun no sanku bunkai jokyō*). Text in Japanese. Preprint, Chemical Society of Japan, Hokkaido Branch, Hokkaido (Japan), p. 61, 1975.

AIR POLLUTION ABSTRACTS, JUNE 1976

(Presented at the Chemical Society of Japan, Hokkaido Branch, Summer Lecture, Meeting, Hokkaido, Japan, July 26, 1975.)

Odor from a fish offal treatment factory was eliminated by passing odors, at 250-350 C through 70 g of pelletized zeolite rock (containing zeolite and tufa) in a quartz tube 760 mm in length, with a 26 mm inner diameter, on top of which there was a 10 cm layer of quartz sand. Into the reactor tube heated to 250-350 C, odorous liquid and dry air were introduced. The air-liquid mixture was gasified in the quartz-sand layer, and diffused through the zeolite rock layer. The gas was removed at 3-hr intervals from the bottom of the tube, and analyzed. Ammonia was not decomposed at 300 C or 350 C. However, at the same temperature in the beginning, ammonia was adsorbed (around 60% of base substitution of zeolite). Acetic acid was eliminated 88% at 250 C, 96% at 300 C, and 100% at 350 C. However, when the column was half-filled with glass balls, there was only 10% elimination at 350 C, less than 25% at 500 C. Ethyl mercaptan was eliminated about 100% at 300 C, and when the column was half-filled with glass balls, 40% at 400 C, 79% at 450 C. In the case of hydrogen sulfide, it was 85% at 250 C, 100% at 300 C, and with glass balls, 55% at 300 C, and 86% at 400 C. Trimethylamine was eliminated primarily at 350 C, some of it being converted to ammonia. With glass balls, hardly any change was observed at 300-500 C. More elimination was achieved at higher temperatures, due to a contact decomposition reaction. It is necessary to do a pre-treatment, eliminating as much ammonia and amine as possible by other methods.

58219

APTIC NO. 76538

Ariake, Shigeichi

ON DUST COLLECTION FOR ELECTRIC FURNACE HOUSING. (*Denro yo tateie shujin ni tsuite*). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(10):865-883, 1975.

The dust collection facility for electric furnace housing at the Amagasaki plant of Otani Heavy Industries, installed in June 1974, is described. It takes 2 hours for one charge, tap to tap, in electric furnace steel manufacture, during which flue gases are emitted in two 3-minute and two 5-minute spurts. Flue gases were collected in the housing in closed storage tanks (total volume 4900 cc for a 45 t furnace) partitioned partially with an air curtain, then exhausted by a suction blower. For two furnaces (45 t, 80 t), the total amount of gases treated was calculated to range from 11,800-35,400 cu m/min. Initial installation costs for a positive blower are lower, but soundproofing costs are higher and maintenance more difficult than for a suction blower. Wind velocity in the main duct was 32 m/s; the duct diameter was 3150 mm. Noise levels, estimated to be nearly 100 dB(A) at the turbo-blower and exhaust duct mouth, were lowered to about 65 dB(A), with baffles and silencers. Dust was collected on polyester filters installed in top-inlet type steel cylinders. The filtration area was 13,000 sq m. The concentration of dust particles after dust collection was below 0.05 g/N cu m. The filtration speed was about 1.2 m/min, at complete filtration. Dust was washed off the filter automatically, at regular intervals, and collected for further disposal.

58220

APTIC NO. 75177

Armento, W. Joseph

EFFECTS OF DESIGN AND OPERATING VARIABLES ON NOX FROM COAL-FIRED FURNACES - PHASE II (FINAL REPORT). Babcock and Wilcox Co., Alliance, Ohio, Research and Development Div., Environmental Protection Agency Contract 68-02-0634, Program Element 1AB014, ROAP 21ADG-041, Rept. EPA-650/2-74-002b, 158p., Feb. 1975.

NTIS: PB 241283/AS

Combustion modification techniques for controlling nitrogen oxide emissions from pulverized coal-fired utility boilers were studied on a 5 million Btu/hr single-burner pilot unit. Nitrogen oxide reductions of up to 65% were achieved by using staged

combustion or by lowering excess air levels from 30 to 0%. Flue gas recirculation yielded only moderate NO_x reductions for coal. Excess air control appears to be the simplest method for NO_x reduction on existing units. Staged combustion can be retrofitted on existing units, where possible, to achieve further NO_x reduction. Staged combustion combined with low excess air firing appears to be the most promising method for NO_x control on new units. (Author abstract modified)

58221

APTIC NO. 82938

Arnold, Orlan M. and Carlo A. Vancini

APPARATUS FOR WASHING GASES AND REMOVING LIQUID ENTRAINED. (Peabody ABC Corp., Warsaw, Ind.) U. S. Pat. 3,880,624. 9p., April 29, 1975. 8 refs. (Appl. Oct. 24, 1973, 24 claims).

An efficient, compact and versatile device for cleaning gases, such as the dust which is generated adjacent to a coal transfer apparatus is described. It includes a gas washing zone, means for supplying a liquid spray to the gases in the washing zone, and a gas drying zone for removing the entrained liquid droplets from the gases. (Author abstract modified)

58222

APTIC NO. 80272

Arvidson, J. M., J. Hord, and D. B. Mann

EFFLUX OF HYDROGEN OR METHANE GASES FROM THE INTERIOR OF A GASEOUS-FUELED AUTOMOBILE. Dept. of Commerce, Washington, D. C., National Bureau of Standards, Motor Equipment Research and Technology Div. Contract OF 4KEO 23, Proj. 2750154, Technical Note 666, 51p., March 1, 1975. 19 refs.

NTIS: COM-75-10288

Experiments were performed to define potential fire and explosion hazards from leakage of gaseous fuels into the passenger compartment in vehicles converted from gasoline. Hydrogen and methane were deliberately leaked into a sedan passenger compartment. Tests were conducted with car doors and windows closed in vented and nonvented configurations. Leakage flow ranged from 19 to 180 standard cu cm/sec and vent areas from 0.0 to 129 sq cm. Combustible gas sensors inside the vehicle detected gas mixing and efflux characteristics. Roof and firewall vents effectively delay explosive gas accumulations in the passenger compartment. Low leakage does not produce flammable gas mixtures where the vent area is 38.7 sq cm or greater. Vents promote dilution of combustible gas mixtures. Nonvented vehicles may hold flammable mixtures over an hr, nearly 10 times the holding times for vented vehicles. High leakage flows of H₂ or CH₄ produced combustible concentrations very rapidly in all vehicles. Hydrogen reaches and decays below flammable concentrations more rapidly. Hydrogen disperses more rapidly, but for the same leakage flow, identical vent areas are required to avoid fire hazard. Criteria for acceptable vent areas are defined. Gaseous dispersion occurred mostly by buoyant flow. The prime location for a combustible gas detector is at the topmost point of the roof, near the roof vent. Both gases appear equally safe in a properly designed vehicle. Ventilation and combustible gas warning systems are recommended for passenger vehicles converted to gaseous fuel. Autos designed for H₂ or CH₄ could replace ventilation systems with appropriate integral design features. (Author abstract modified)

58223

APTIC NO. 82832

Arvin, John R., Robert E. Sullivan, Dennis L. Troth, and Albert J. Verdouw

COMBUSTION APPARATUS WITH SECONDARY AIR TO VAPORIZATION CHAMBER AND CONCURRENT VARIANCE OF SECONDARY AIR AND DILUTION AIR IN A REVERSE SENSE. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,899,881. 10p., Aug. 19, 1975. 7 refs. (Appl. Feb. 4, 1974, 3 claims).

A combustion apparatus for gas turbine engines particularly adapted to reduce emissions to meet automotive requirements

is described. The fuel is laid on the wall of a cylindrical prechamber and evaporated from the wall by combustion air which is introduced through a swirler at the upstream end of the prechamber. The inner surface of the prechamber is artificially roughened by a grid of grooves to improve fuel evaporation. The fuel is laid on the wall from an annular manifold extending around the upstream end of the prechamber through tangential orifices leading from the manifold into the interior of the prechamber. The fuel manifold is cooled and shielded from heat by an air jacket. More air enters through entrance ports distributed around the prechamber toward its downstream end. The resulting lean fuel air mixture is delivered past an annular flow dam at the outlet of the prechamber into a combustion or reaction zone which is abruptly enlarged from the prechamber. The structure causes turbulent flow, recirculation, and good mixing in the reaction zone. A pilot fuel nozzle to aid in cold starts is mounted at the upstream end of the prechamber. The arrangements for varying the relative quantities of combustion and dilution air in a combustion apparatus are improvements over previous devices. (Author abstract modified)

58224

APTIC NO. 83567

Asanagi, Etsuo, Kunihiko Yokota, Kenji Nakase, and Chu Wakabayashi

REMOVAL OF HYDROGEN SULFIDE FROM GASES. (Ryukasuiso ganyugasu no datsuryu hoho). Text in Japanese. (Chiyoda Chemical Engineering and Construction Co., Ltd. (Japan)) Japan. Pat. Sho 50-15753. 4p., June 7, 1975. (Appl. Sept. 25, 1971, 1 claim.)

Hydrogen sulfide-containing gases are contacted with N-Nprime-polyoxyalkylene alkyl amide, expressed by R-CON(R2O)mH.(R2O)nH, where R is an alkyl or alkylene radical with a carbon atom number of 7-30, R2 is (-CH2-CH2-) or -CH2-CH(CH3)-, m and n are integers and m + n is not less than 2 and not larger than 21. Hydrogen sulfide is oxidized during absorption or after absorption. Elementary sulfur is produced and hydrogen sulfide is removed. Thus, 1 wt% NaOH was added to 1 mole of oleic acid amide. After removing air in the vessel with nitrogen, 10 mole of ethylene oxide was added. The reaction at 140-150 C gave N-Nprime-polyethyleneoxyoleyl amide. This amide (300 ml) was charged into a reaction tower, 50 mm in diameter and 300 mm high, and kept at 80 C. A gas (1 vol% H₂S, 0.5% sulfur dioxide, and 98.5% nitrogen) was passed through the tower at a rate of 300 ml/min. Paper chromatographic determination of the gas coming out of the tower showed that the H₂S concentration was less than 0.001%. The particles of sulfur thus formed were large enough for separation by decantation. After 5 hr, 1.7 g solid S were obtained.

58225

APTIC NO. 83651

Ashihara, Kazunori

TRENDS OF THE CONTROL OF GASES DISCHARGED FROM ENGINES. (Engin no haishutsu gasu kisei to taisaku no doko). Text in Japanese. Preprint, Fuel Society, Combustion Section, p 1-14, 1975. 7 refs. (Presented at the Combustion Method of New Engines Seminar, Tokyo, Japan, June 9-10, 1975.)

The history of governmental regulation of automobile exhaust gases, the present situation of the testing of exhaust gases, and control of exhaust gases are discussed. The first governmental regulation became effective in Sept. 1966 for carbon monoxide, based on the 4-mode method. More severe regulations were issued year by year not only for CO but also for hydrocarbons and nitrogen oxides. At present, the measurement of these exhaust gases is by the 10-mode test, 11-mode test, and the long distance running test. Suppression of poisonous exhaust gases is being studied by 3 methods: the improvement of the gas supply system; the improvement of the engines themselves; and the development of methods of treating exhaust gases. Exhaust gas treatment by the AIS method, thermal reactors, or catalysts is discussed. In the AIS

method, hot unburnt gas is burned by the addition of air near the exhaust valve. The catalytic method is the most practicable, but it is accompanied by serious demerits. The catalyst life is very short at present. Secondary pollution is a problem. Automobiles are not necessarily driven by knowledgeable mechanics, and pollution control plans must take this into consideration.

58226

APTIC NO. 84273

Astakhov, V. A., V. D. Lukin, P. G. Romankov, R. A. Mokhnatkin, and D. M. Portnov

STUDY OF THE DISPLACEMENT TYPE DESORPTION OF CARBON DISULFIDE FROM ACTIVATED CARBONS. (Issledovanie protsessy vytesnitel'noy desorbtsii serougleroda iz aktivnykh ugley). Text in Russian. Zh. Prikl. Khim., 48(9):1975-1978, Sept. 1975. 3 refs.

A method for the adsorption of carbon disulfide from flue gases generated in synthetic fiber production, and for its desorption for subsequent recycling within the production process is described. After the removal of hydrogen sulfide, the waste gases are sent through an adsorber containing activated carbon on plates for adsorption. Displacement type desorption of CS₂ is done with pressurized steam at 70-90°C temperature. In this manner, it is possible to avoid the oxidation of sulfur and part of the adsorbed CS₂ to sulfuric acid which is catalyzed by the activated carbon.

58227

APTIC NO. 80305

Atkins, Richard S. and David H. Klipstein

IMPROVED PRECIPITATOR PERFORMANCE BY SO₃ GAS CONDITIONING. Natl. Eng., 79(11):5-8, Nov. 1975. (Presented at the American Power Conference, Annual, 37th, 1975.)

Gas conditioning can dramatically improve the performance of electrostatic precipitators at relatively low cost. It can be applied to precipitators already in operation and to new units. It involves injecting small quantities of a chemical into the flue gas which optimizes the electrical resistivity of fly ash, making it more amenable to collection in a precipitator. Precipitator performance is discussed. Dust conductivity may be increased by small quantities of easily ionized chemicals called conditioning agents. Typically, conditioning compounds for each type of dust are found by educated trial and error. The most common conditioning agents are sulfuric acid and ammonia. There are several types of commercial sulfur trioxide gas conditioning systems: evaporation of liquid SO₃; catalytic conversion of sulfur dioxide; vaporization of sulfuric acid; and sulfur burning followed by the catalytic conversion of SO₂ to SO₃. The simplest is a liquid SO₃ gas conditioning system. Sulfuric acid is heated above its boiling point, vaporized, and diluted with air in acid vaporization. Then it is injected into the flue ahead of the precipitator. About 70 to 75% of SO₂ can be converted to SO₃ by catalytic conversion. The resultant mixture will then be injected into the flue gas. Sulfur burning is also described. In situ, portable test, mobile, and computer equipment is discussed. When switching to a lower sulfur fuel, existing precipitators are unlikely to maintain performance without either increased precipitator capacity, reduction in boiler operating rate, or gas conditioning.

58228

APTIC NO. 82038

Atsukawa, Masumi, Hiroyuki Ushio, and Masaaki Yanagi

METHOD FOR IMPURITY REMOVAL IN A WET LIME-GYPSUM PROCESS EXHAUST DESULFURIZATION EQUIPMENT. (Mitsubishi Jukogyo Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,903,243. 4p., Sept. 2, 1975. 3 refs. (Appl. Nov. 22, 1972, 2 claims).

A lime slurry desulfurization process which recovers gypsum as a by-product is described. The process differs from prior art arrangements in that impurity separation costs are kept to a minimum by recycling the filtrate. The sulfur oxide-containing gas is led to a cooling tower where it is humidified and cooled

with a liquid. Next, the gas enters an absorption column where it is contacted with a lime slurry absorbent solution for sulfur oxide removal. The clean gas is released to the atmosphere via a demister and stack. The filtrate resulting from the separation of by-product gypsum is collected in a storage tank and is fed to a cooling tower and then sprayed as a humidifying and cooling medium in the tower. The cooling tower liquid is partly drained off into a neutralizing tank where the liquid is mixed and neutralized with a part of the slurry absorbent solution. The mixture is passed through a filter simultaneously to separate and remove metallic impurities as well as dust collected from the gas in the cooling tower. Carbon dust collected from the gas provides nuclei for the flocculation of the metallic hydroxides formed by the neutralizing reaction. The gas which is freed from most of its dust content in the cooling tower is then sent to the absorption column where it is contacted with lime slurry for the removal of more than 90% of its sulfur oxide content.

58229

APTIC NO. 83092

Atsukawa, Masumi, Kikushi Tsuneyoshi, and Yoshihiro Shiraishi

STACK GAS DESULFURIZATION METHOD RECOVERING HIGH QUALITY LIME SULFITE. (Kojundo no arysan sekkai o kaishu suru haen datsuryo hoho). Text in Japanese. (Mitsubishi Heavy Industries Ltd. (Japan)) Japan. Pat. Sho 50-29839. 5p., Sept. 26, 1975. (Appl. Nov. 30, 1971, 1 claim).

A stack gas desulfurization method which will recover extremely pure lime sulfate as a by-product jointly using the lime method and soda method or the ammonia method of scrubbing is described. This process is an improvement over the conventional wet type lime method stack gas desulfurization process which is not effective in recovery of resources. The exhaust gas is introduced to a lime scrubber and a soda scrubber, and the absorption solution of the lime scrubber and the soda scrubber is mixed in a reaction tank. The lime method scrubber has a 90% sulfur dioxide removal rate with the pH of the absorption solution controlled at 7 while the soda method scrubber also has a high sulfur dioxide removal rate with the absorption solution controlled at pH 7. The reaction solution will be sent to a liquid/solid separator where lime sulfite and soda sulfite will be separated. The recovered lime sulfite is of superb quality and forms into flat particles of a size of 2-10 micron. The new process is also free of scale troubles.

58230

APTIC NO. 83121

Atsukawa, Masumi, Naoharu Shinoda, and Haruo Kuwubara

METHOD OF SEPARATING IMPURITIES FOR REMOVAL IN DESULFURIZATION OF EFFLUENT GAS IN A WET LIME-GYPSUM PROCESS. (Mitsubishi Jukogyo Kabushiki Kaisha (Japan)) U. S. Pat. 3,888,968. 4p., June 10, 1975. 5 refs. (Appl. Nov. 8, 1972, 2 claims).

A method of separating deposited soot and other metallic impurities from the gas and material line in a process for removing sulfur oxide from sulfur oxide containing gas is described. Lime slurry is used as the absorbent. The carbon dust collected from the gas is utilized as nuclei for flocculation of the hydroxides. The process permits recycling of the filtrate which in other processes is abandoned without further treatment. This avoids the problem of waste draining. (Author abstract modified)

58231

APTIC NO. 84108

Atsukawa, Masumi, Kikushi Tsuneyoshi, and Yoshihiro Shiraishi

CALCIUM SULFITE MANUFACTURING METHOD. (Aryusan sekkai no seizo hoho). Text in Japanese. (Mitsubishi Heavy Industries Ltd. (Japan)) Japan. Pat. Sho 50-31116. 4p., Oct. 7, 1975. (Appl. Dec. 6, 1971, 1 claim).

A calcium sulfite manufacturing method, which produces highly pure calcium sulfite using an absorption solution con-

taining calcium hydroxide or carbonic calcium and soda compounds, and gas or an aqueous solution containing sulfur oxide or sulfur dioxide is described. Calcium sulfite is in demand for use as a plastic filler. Important factors such as shape, granular size, and impact strength of the calcium sulfite are unsatisfactory for use as a plastic filler when calcium sulfite is produced by conventional methods. The characteristic of the new method is the addition of a specified proportion of sodium carbonate to a solution of calcium hydroxide slurry to produce calcium sulfite suitable for use as a plastic filler; it has a 2-10 micron columnar and/or rectangular plate shape. Used with wet-type lime stack gas desulfurization, this process will reduce scaling in the scrubber and reduce the number of the absorption columns required from two to one. Calcium sulfite of high purity can be recovered as a by-product. The new mixed absorption solution has a sulfur removal efficiency of more than 90%.

58232

APTIC NO. 83348

Atwood Gilbert R., Robert J. Blake, Kenneth F. Butwell, and David A. Dunnery

PROCESS FOR THE SELECTIVE REMOVAL OF SULFUR DIOXIDE FROM EFFLUENT GASES. (Union Carbide Corp., New York) U. S. Pat. 3,904,735. 8p., Sept. 9, 1975. 5 refs. (Appl. June 12, 1973, 12 claims).

A method for scrubbing sulfur dioxide and mixtures of SO₂ and sulfur trioxide from effluent gases is described. Aqueous trialkanolamines or tetrahydroxyalkyl alkylene diamines or the corresponding amine and diamine sulfites are used as the absorbent solvent composition. The method can be used even where the effluent gases contain a preponderance of carbon dioxide. The absorbent solvent can be regenerated, which offers significant advantages economically over prior art processes necessitating the use of a quantitative amount of reagent which cannot be regenerated. (Author abstract modified)

58233

APTIC NO. 82053

August, Paul

DEVICE FOR TREATMENT OF EXHAUST GASES FROM AN INTERNAL COMBUSTION ENGINE. (Assignee not given.) U. S. Pat. 3,913,323. 5p., Oct. 21, 1975. 11 refs. (Appl. March 22, 1973, 11 claims).

A device for treatment of exhaust gases from an internal combustion engine is described in which exhaust gases are exposed to two serially arranged beds of catalytic material. The exhaust gas passes through a first bed of catalytic material which reduces nitrous oxides and is then supplied to a main flow channel which takes the form of a thermal reactor and which is surrounded by a bed of catalytic material in which carbon monoxide and hydrocarbon are oxidized. A control valve in the main flow channel is adjustable to control the share of the gas leaving the first bed of catalytic material which passes through the second bed of catalytic material. Additional air is supplied to the stream of exhaust gases, especially in the region immediately downstream of the first bed of catalytic material. This device is an improvement over other devices in that it produces superior results, operates efficiently under all conditions, and can easily be installed in an engine arrangement.

58234

APTIC NO. 81924

Bachman, K. C. and E. L. Kayle

REACTIVE EXHAUST EMISSIONS FROM A STRATIFIED-CHARGE ENGINE VEHICLE. Am. Chem. Soc. Petrol. Chem. Preprints, 20(3):652-658, Aug. 1975. (Presented at the American Chemical Society, Division of Petroleum Chemistry, Inc., Symposium on Chemistry of Combustion in Engines, Philadelphia, Pa., April 6-11, 1975.)

Comparative emission measurements were made on a stratified charge engine (compound vortex, controlled combustion) and conventional V-8 and smaller engines to determine if the com-

bustion chamber design and the lean air/fuel ratio of the CVCC engine has any significant effect on the composition of either hydrocarbon or aldehyde emissions. The stratified charge engine did not differ from conventional engines either in the composition of hydrocarbon and aldehyde emissions or in the specific reactivity of hydrocarbon emissions for a given fuel aromatic content. However, the lower mass emissions from the stratified charge engine made it less of a contributor to overall atmospheric hydrocarbon burden. The average hydrocarbon emissions from the CVCC engine amounted to 0.37 g/mi versus 1.6, 4.2, and 1.7 g/mi from a V-8, a 1600 cc and a 1900 cc engine, respectively. Aldehyde emissions from the CVCC engine averaged about 0.03 g/mi as compared with about 0.1 g/mi for the conventional engines. The total aldehyde emissions with both types of engines were generally only about 1/10 of the total hydrocarbon emissions.

58235

APTIC NO. 83578

Bachmann, William V.

ANNULAR PISTON ENGINE WITH AFTERBURNER AND SEPARABLE POWER TURBINE. (Assignee not given.) U. S. Pat. 3,885,386. 18p., May 27, 1975. 8 refs. (Appl. April 22, 1974, 24 claims).

An improved internal combustion engine is described which inherently provides a dramatically reduced level of exhaust emissions in comparison to other engines. Crankcase blowby emissions are either totally eliminated or substantially reduced. The engine operates efficiently with unleaded fuels, and does not require the use of timed movable inlet and exhaust valves. The piston speed is drastically reduced without affecting the power output. The engine substantially reduces the heat loss through the cylinder walls and cylinder head and converts the heat saved to do part of the work output of the engine. Ambient air is drawn in by the action of the engine's reciprocating piston to act as a coolant for the inner cylinder wall and as a mixing agent to the exhaust gases via the afterburner, thereby promoting the oxidation of the unburned particles within the exhaust emissions. The engine extracts or generates a substantial quantity of energy from the specially pretreated and boosted exhaust gas pressures via a gas turbine device which is part of the engine. (Author summary modified)

58236

APTIC NO. 83172

Badhwar, Ravinder K.

CHLORINE RECOVERY WITH AQUEOUS HYDROCHLORIC ACID. (Dow Chemical Co., Midland, Mich.) U. S. Pat. 3,881,893. 5p., May 6, 1975. 5 refs. (Appl. Dec. 4, 1972, 15 claims).

A process for the recovery of chlorine from gaseous mixtures using aqueous hydrochloric acid as an absorbing agent for the chlorine is discussed. The residual chlorine vapor is ordinarily separated from admixture with air by absorbing the Cl₂ into a suitable absorbent. The prior art uses either an organic liquid or water. The organic liquid causes the loss of a portion of the liquid. Air pollution and expense in adding make-up are the main disadvantages. By bringing a gaseous mixture containing less than 60 wt% Cl₂ vapor into contact with aqueous hydrochloric acid, a major portion of the Cl₂ in the gaseous mixture is absorbed by the acid. The remainder of the gaseous mixture normally consists of components of atmospheric air and relatively little residual Cl₂ and may be vented off, but more usually is first scrubbed with an aqueous reactant for the residual Cl₂. The aqueous acid containing absorbed Cl₂ is exposed to a reduced pressure or is heated, or both, which causes release of the absorbed Cl₂. The Cl₂ vapor is removed from the acid and the acid is recovered for further fluid contacting, as by recycling. (Author summary modified)

58237

APTIC NO. 82298

Bailey, Henry E.

SPLIT PISTON TWO-STROKE FOUR CYCLE INTERNAL COMBUSTION ENGINE. (Assignee not given.) U. S. Pat. 3,895,614. 7p., July 22, 1975. 7 refs. (Appl. Dec. 3, 1973, 10 claims).

A two-stroke four cycle internal combustion engine for mobile equipment (motorcycles, outboard motor applications) that results in reduced hydrocarbon and carbon monoxide emissions is described. The engine is provided with a split piston which reciprocates within a cylinder having primary and secondary precombustion chambers. The lower portion of the piston is split by means of a partition which divides the cylinder into opposed air and combustible charge pumping chambers. One-way flow valves are provided to control the flow of air and a combustible charge into respective pumping chambers as the piston moves along its compression stroke. Movement of the piston along its power stroke compresses volumes of air and the charge within the pumping chambers, with these volumes then being directed through ports formed in piston skirt and the cylinder wall and then into the precombustion chambers through one-way flow valves. Exhaust gases are scavenged through exhaust ports in the cylinder wall which are exposed as the piston completes its power stroke. Scavenging is assisted by the injection of air directed from the pumping chamber through a one-way flow valve in a mid portion of the cylinder wall. Reciprocating movement of the piston and partition is converted into rotary motion through a cam follower mounted on a plate and moving in the cam track of a cylindrical cam. (Author abstract modified)

58238

APTIC NO. 82998

Bailey, Henry E., Dennis H. Bailey, and Richard E. Bailey

TURBINE ENGINE. (Assignee not given.) U. S. Pat. 3,899,874. 7p., Aug. 19, 1975. 6 refs. (Appl. Sept. 11, 1974, 8 claims).

A turbine engine of simplified, single shaft construction which runs on an open cycle mode of operation is described. Recent governmental legislation requires manufacturers of mobile equipment powered by gasoline fueled internal combustion engines to reduce harmful exhaust by means such as external emission control devices, engine modification, or other methods. This engine achieves complete expansion with constant volume combustion and operates with reduced amounts of harmful exhaust emissions. A centrifugal air compressor is mounted for rotation with a turbine rotor on a single shaft within a housing. Air is compressed and preheated within a chamber concentric with the rotor. The engine operates with a minimum of friction and has a relatively high power to weight ratio. (Author summary modified)

58239

APTIC NO. 76485

Baker, Dale E., Stephen Welch, William Stout, and Willie Doty

KILN DUST FROM CEMENT FACTORIES FOR VACUUM FILTER PROCESSING OF SEWAGE SLUDGE. *Compost Sci.*, 16(4):28-30, July-Aug. 1975. 3 refs.

Kiln dust from cement factories was compared to hydrated lime for use in vacuum filter processing of sewage sludge. Kiln dust is equal to hydrated lime for processing sewage sludge and is superior if it is used at a rate of 1.3 times that normally used for lime. The additional potassium and magnesium in the kiln dust is beneficial where the filter cake and/or filtrate effluent are used as sources of nutrients for crop production. Kiln dust delivered to the treatment plant is worth 75% as much as K and Mg contained in the kiln dust if the filtered sewage sludge and the filtrate were used on cropland. (Author summary modified)

58240

APTIC NO. 83210

Balla, Paula A. and Charles C. Oshinski

METHOD AND APPARATUS FOR AGGLOMERATING DRY DUST PARTICLES IN A GAS STREAM AND SEPARATION. (Bethlehem Steel Corp., Bethlehem, Pa.) U. S. Pat. 3,883,324. 9p., May 13, 1975. 7 refs. (Appl. May 2, 1973, 8 claims).

AIR POLLUTION ABSTRACTS, JUNE 1976

A method and apparatus for improving the efficiency of dry dust recovery from moving gases are described. A constriction is located in a duct carrying dirty gas from a dust producing industrial operation, such as a blast furnace, to a dust catcher. The constriction may be a central orifice plate which reduces the cross sectional flow area in one portion of the dust to about 1/4 of the area of the remaining portions of the duct. This accelerates the velocity of gas flow through that portion of the duct. The location of the constriction when used with a cyclone type dust catcher must be at least five duct diameters upstream of the dust catcher in order to increase dry dust collection. This device enables the particles of flue dust to be collected and transported in a perfectly dry state and in much larger tonnages than with a conventional dry type dust catcher. (Author abstract modified)

58241

APTIC NO. 82055

Balluff, Robert N.

LOUVER CONSTRUCTION FOR EXHAUST GAS DEVICE. (Tenneco Inc., Racine, Wis.) U. S. Pat. 3,912,040. 4p., Oct. 14, 1975. 3 refs. (Appl. Aug. 15, 1974, 4 claims).

An improved louver construction for use with beds of non-metallic particulate material, such as catalyst pellets, is described. The construction minimizes losses of the material due to abrasion. The louvers are formed with lips that extend outwardly of the walls of the bed to minimize the sharp edges that are presented to the particles and to minimize gas turbulence. The system is suitable for use with packed exhaust gas mufflers. (Author summary modified)

58242

APTIC NO. 84238

Banse, D.

THE GENK-LANGERLO POWER PLANT. START-UP AND ABATEMENT OF NUISANCES. (*La centrale de Genk-Langerlo. Mise en service et lutte contre les nuisances*). Text in French. *Electricite*, no.161:31-32, 35-36, Dec. 1975.

Aside from water vapors, combustion fumes constitute the main source of air pollution at the Genk-Langerlo power plant. The plant has been designed for combustion of a heavy fuel and a BTS fuel low in sulfur. In cases of unfavorable atmospheric conditions, only BTS fuel is used. The boiler system has been designed for the combustion of natural gas without sulfur. Chimneys measure 140 m and assure a diffusion of smoke which reduces immissions. Monitoring is effected at the level of the physico-chemical composition of the fumes for concentrations of sulfur dioxide, nitrogen oxides, and carbon monoxide, for opacity and concentration of dusts, and for localized oxygen and hydrogen concentrations. The liquid combustibles storage tanks are operational, and the combined feeding system has been successfully tested. The adjustment of the monitoring systems is underway.

58243

APTIC NO. 83277

Barber, Everett M., John T. Brandenburg, and Richard A. Frost

INTERNAL COMBUSTION ENGINE SYSTEM FOR EXHAUST EMISSIONS CONTROL UTILIZING AN ACOUSTIC CATALYTIC MUFFLER. (Texaco, Inc., New York) U. S. Pat. 3,884,037. 8p., May 20, 1975. 6 refs. (Appl. May 13, 1971, 9 claims).

An internal combustion engine is provided with additional air adjacent the exhaust valves, valve means for back pressure control in the exhaust system, and an acoustic catalytic muffler having compounds capable of reducing lead products of combustion in exhaust gases prior to their contact with a combination of oxidation catalysts. (Author abstract)

58244

APTIC NO. 76546

Barber, J. C.

POLLUTION CONTROL IN FERTILIZER MANUFACTURE. *J. Environ. Quality*, 4(1):1-11, Jan.-March 1975. 19 refs. (Presented at the American Society of Agronomy, Annual Meeting, 65th, Las Vegas, Nev., Nov. 15, 1973.)

Sources and control of air pollutants in the manufacture of fertilizer are reviewed. Particulate emissions from ammonium nitrate and urea prilling towers are the cause of one of the major air pollution problems. The particulates are small and are discharged in large volumes of gas, conditions which prevent the use of most high energy particulate removal equipment. At new nitrogen fertilizer production facilities problems can be lessened by the selection of low energy scrubbers, possibly combined with gas recycle or urea and ammonium nitrate granulation processes which are amenable to particulate pollution control. A medium or low pressure drop scrubber is not completely adequate to meet abatement requirements at existing facilities. Miscellaneous discharges are major problems at fertilizer production facilities. Losses result from fugitive dust, pump leaks, vessel and tank overflows, and other inadvertent discharges. Much of the discharges can be avoided by adherence to good engineering practice in the design and construction of the fertilizer facility, or by the addition of special equipment to prevent such discharges. (Author conclusions modified)

58245

APTIC NO. 76547

Barnes, T. M., H. W. Lownie, Jr., and J. Varga, Jr.

CONTROL OF COKE-OVEN EMISSIONS. *Ironmaking Steelmaking*, 2(3):157-187, 1975. 54 refs.

A state-of-the-art study on the control of coke-oven emissions is presented based on trips to and observations of operations in 32 commercial coke-oven plants in North America, Japan, and Europe. Emphasis is placed on charging of ovens, pushing of coke from ovens, sealing of coke-oven doors, handling of coal and coke, and control for the prevention of green coke. A substantial reduction in massive noxious emissions from by-product coke ovens (new and old) is possible by new construction, process modification, and other measures that could be completed within a design and construction time of 24-30 month/battery. A substantial lowering of the lesser emissions of particulate matter from handling and quenching is attainable. It is not possible to control all of the emissions at all times to all standards specified or implied in the present law. (Author abstract modified)

58246

APTIC NO. 79713

Barniske, Lothar

NEW METHODS OF THERMAL WASTE TREATMENT. (*Neue Verfahren der thermischen Abfallbehandlung*). Text in German. *Muell Abfall*, 7(5):125-127, 1975. (Presented at the Waste Technology Colloquium, 28th, Stuttgart, West Germany, March 14, 1975.)

Environmental and other advantages and disadvantages of different new municipal waste treatment technologies are evaluated. Degassing and/or gasification of primarily domestic wastes for energy recovery is environmentally advantageous because a fuel gas with low organic matter content is obtained between 800 and 1000 C, and practically no air pollution is generated. The degassing and/or gasification of special wastes for material recovery generates practically no air pollution, and methods representing a combination of gasification (and/or degassing) and incineration of domestic wastes for energy recovery generate cleaner flue gases than conventional incineration.

58247

APTIC NO. 83635

Barniske, Lothar and Werner Schenkel

STATE OF ART OF WASTE INCINERATOR PLANTS WITH HEAT RECOVERY IN WEST GERMANY. (*Entwicklungstand der Muellverbrennungsanlagen mit*

Waermeverwertung in der Bundesrepublik Deutschland). Text in German. *Convers. Refuse Energy, Int. Conf. Tech. Exhib.*, 1st, Montreux, Switzerland, 1975. 6p. 9 refs. (Nov. 3-5.)

A state-of-the-art report is presented on waste incinerator plants with heat recovery in West Germany. Large-capacity waste incinerator plants utilize their waste heat usually in the form of steam with 400-500 C under 40-100 bar pressure for electricity generation, and partly for remote heating. Small-capacity waste incinerators generate steam with 200-250 C under 15-20 bar, which is used directly for remote heating or by industrial plants in the vicinity. Except for a few small-capacity incinerators, incinerators are usually equipped with electrostatic precipitators. High-efficiency separation of hydrogen chloride and hydrogen fluoride will be required in the future.

58248

APTIC NO. 82980

Barthel, Yves, Sigismund Frankowiak, and Philippe Renault

PROCESS FOR WITHDRAWING HYDROGEN SULFIDE FROM AN INDUSTRIAL GAS WITH SULFUR PRODUCTION. (*Institut Francais du Petrole, des Carburants et Lubrifiants, Rueil-Malmaison (France)*) *U. S. Pat.* 3,875,295. 4p., April 1, 1975. 4 refs. (Appl. May 30, 1973, 10 claims).

A process for withdrawing hydrogen sulfide from an industrial gas with sulfur production is described. Hydrogen sulfide is removed and S produced by contacting an H₂S containing gas with sulfur dioxide in reduced proportion. The effluent gas, containing residual H₂S, is contacted with an absorbent solution for H₂S absorption. Absorbed H₂S is released and burnt for supplying SO₂. (Author abstract modified)

58249

APTIC NO. 83707

Bauer, Carl F.

CARBURETOR WITH AUTOMATIC AIR-FUEL RATIO ADJUSTMENT CONTROL. (*Universal Oil Products Co., Des Plaines, Ill.*) *U. S. Pat.* 3,899,552. 3p., Aug. 12, 1975. 6 refs. (Appl. March 1, 1974, 5 claims).

The invention provides a means to automatically and rapidly adjust the air-fuel ratio of a carburetor in response to changes in the character of the exhaust gases detected by repeated samplings of the gas. When the mixture leaving the exhaust manifold is just on the rich side of stoichiometry, the amount of exhaust pollutants, carbon monoxide, hydrocarbons, and oxides of nitrogen, present will be at a minimum. The adjustment of the air-fuel ratio is made by continuously moving or adjusting the valve seat of the main fuel jet in a constant depression type of carburetor. The adjustment is made in steps by a stepping motor which rotates on eccentric cam. The cam is actuated in response to intermittent electrical signals produced by a closed loop control system when the oxygen content of the exhaust gases varies from stoichiometry or from any other desired value. The valve seat of the main fuel jet needle valve is mounted for axial sliding movement and is biased away from the needle portion of the valve and into contact with the cam and sealed relative to the carburetor housing by a thin beryllium copper bellows. Although the principal adjustment in the air-fuel ratio is provided by the carburetor's vacuum actuated piston and cylinder which moves the needle valve up and down in response to vacuum conditions in various portions of the carburetor, the movable mounting for the valve seat permits additional adjustments to be made which will achieve a minimum of exhaust pollutants. (Author abstract modified)

58250

APTIC NO. 76525

Bauerle, George L., S. C. Wu, and Ken Nobe

CATALYTIC REDUCTION OF NITRIC OXIDE WITH AMMONIA ON VANADIUM OXIDE AND IRON-CHROMIUM OXIDE. *Ind. Eng. Chem. Prod. Res. Develop.*, 14(4):268-273, Dec. 1975. 9 refs.

The reduction of nitric oxide with ammonia on alumina supported vanadium oxide and iron oxide/chromium oxide catalysts was studied in flow reactors between 200 and 515 C. The rate of reduction of NO on both catalysts reaches a maximum at about 400 C and is considerably enhanced by the presence of oxygen. Acceleration of NO reduction is a strong function of O₂ concentration up to 1% O₂ with 1000 ppm of NO and either stoichiometric or excess NH₃. Reduction of NO is a function of NH₃ to NO ratio from 0.5 to 1.4 in simulated flue gas containing 14% carbon dioxide, 5% water vapor, 3% O₂ and with NO varying from 250 to 1000 ppm. The presence of sulfur dioxide in the gas mixture does not appreciably affect the reduction of NO on either catalyst at 400 C. (Author abstract)

58251

APTIC NO. 84065

Baum, F. and J. Hager

EVALUATION OF THE EMISSIONS OF A CHEMICAL DRY CLEANING PLANT. (*Beurteilung der Emissionen von Chemischreinigungsanlagen*). Text in German. *Gesundh.-Ingr.*, 96(12):348-352, 1975. 9 refs.

Dry cleaning machines generally incorporate cleaning solutions of organic solvents and detergents, a distillation system, and a drying and recovery system. Factors contributing to odor pollution are inadequate ventilation, defective slub sieves, improperly placed blow-out valves, overloaded activated carbon, and insufficient maintenance. Inspections involve a survey of the premises for spatial arrangements and proper ventilation. The Drager gas detector, sensitive to various substances, may be used to control air filtration equipment by use of a gas detection pump in conjunction with a Drager tube. There is a discussion as to whether certain emission control measures merit promotion with respect to economics.

58252

APTIC NO. 82539

Baum, Jorg P.

VENTURI SCRUBBERS. (*Verfahrenstechnik Dr.-Ing. Kurt Baum, Essen (Federal Republic of Germany)*) U. S. Pat. 3,898,308. 8p., Aug. 5, 1975. 12 refs. (Appl. Aug. 17, 1973, 7 claims).

A venturi-type gas scrubber for precipitating solid particles and/or scrubbing aerosols and gaseous components out of air and gases is described. The nozzles are arranged in the wide sides of the wall of the venturi neck, which produces jets of water which are adjustable in cross section. The nozzles are staggered with respect to each other in a plurality of rows located opposite each other. Upstream of the nozzles adjustable flaps are arranged in the wall of the venturi neck. Each of the nozzles is provided with a tubular diaphragm to control the flow. The nozzles of each side wall are connected to a water box which in turn communicates with a water feed line via a valve. The efficiency of the venturi scrubbers is imported within a very wide range of different operating conditions in comparison to other scrubbers.

58253

APTIC NO. 82915

Baum, Jorg Peter

METHOD FOR COLLECTING THE FLUE GASES PRODUCED UPON THE CHARGING OF SCRAP AND TAPPING OF STEEL FROM ELECTRIC FURNACES. (*Verfahrenstechnik Dr.-Ing. Kurt Baum, Essen (Federal Republic of Germany)*) U. S. Pat. 3,876,418. 6p., April 8, 1975. 3 refs. (Appl. July 10, 1972, 4 claims).

A charging basket is brought into sealed engagement with the furnace and is subjected to a vacuum. The top of a ladle is provided with an opening which is also subjected to a vacuum. Gases from the charging basket and from the ladle are delivered to a main aspirator duct to join gases generated during furnace operation for subsequent treatment. (Author abstract modified)

34

58254

APTIC NO. 84142

Baum, J. P. and J. W. Gehrhardt

WASTE GAS CLEANING FACILITIES IN THE IRON AND STEEL INDUSTRY AND THEIR COSTS. (*Abgasreinigungsanlagen in der Eisen- und Stahlindustrie und ihre Kosten*). Text in German. *Tech. Mitt.*, 68(11):435-441, 1975.

Air purification installations in the iron and steel industries and their cost are discussed. The largest pollution source in pig iron production is the sinter band and, less significantly, the blast-furnace. In the case of the former, emissions are derived from the sinter gas proper and sinter cooling upon release of the sinter. The problem of dust separation here can be regarded as solved. Gaseous pollutant removal, especially sulfur dioxide from waste gases is by means of venturi-wet cleaners in the U. S., while West Germany has only initiated a testing program. In blast-furnace operation, the counter-pressure process employs high-efficiency venturi-washers to purify gases and separate dust particles from the exhaust in 2 steps. In steel mills, venturi-washers are used to cleanse waste gases which can reach a dust content of 100 mg/cu m. Efficient suction installations for dust emission during loading and unloading of mixes, desulfurization of pig iron and filling and emptying of converters are used for secondary dust separation. For pig iron charge suction, a suction hood is attached to the front of the converter directly above it to control smoke and smoke gas emission. The chief task in the purification of electric steel furnaces is to cleanse their waste gases by a suction process. Bag filters or venturi scrubbers are used. In a pig iron production of 1.5 times 10 to the 6th power t/yr, the expenses for gas purification are calculated to be at \$0.23/t while for a steel production of 3 times 10 to the 6th power t/yr, dust separation runs to \$0.50/t; in an electric steel mill, with 250,000 t production, the cost is \$1.20/t for dust removal.

58255

APTIC NO. 82078

Baum, Kurt, Joerg Peter Baum, Jai Kumar Pearce, and David Lee Schroeder

METHOD AND APPARATUS FOR AIR POLLUTION CONTROL COMBINED WITH SAFE RECOVERY AND CONTROL OF GASES FROM A BOTTOM-BLOWN STEEL CONVERTER VESSEL. (*Pennsylvania Engineering Corp., Pittsburgh, Pa.*) U. S. Pat. 3,908,969. 13p., Sept. 30, 1975. 12 refs. (Appl. March 12, 1973, 45 claims).

A method and apparatus for air pollution control are described which are combined with safe recovery and control of gases from a bottom blown steel converter vessel. The benefits derived from use of the collected gases significantly enhance economics by reducing the costs required to meet air pollution standards. A gas collector hood is located close to the mouth of the converter vessel. A mixture of oxygen and entrained powered materials and a hydrocarbon fluid as a cooling agent are blown through tuyeres in the bottom of the vessel and diffuse through the hot metal in the vessel. The inherently finer dust produced from the bottom blown oxygen process requires that for proper air pollution control a non-combustion system is used to take advantage of the increased agglomerating properties of iron oxides. When blowing is initiated, carbon monoxide and hydrogen evolve immediately. Air is aspirated into the gas collector hood so that an inert gas plug is formed which purges the exhaust system of combustion air. Nitrogen is injected as required into the hood in addition to air aspirated to artificially create inertization to turn down a heat at high carbon levels, for emergency vessel turn down, and for special heats. (Author abstract modified)

58256

APTIC NO. 82041

Bauman, Dieter

PROCESS AND APPARATUS FOR CLEANING EXHAUST FUMES. (*Assignee not given*) U. S. Pat. 3,908,367. 11p., Sept. 30, 1975. 11 refs. (Appl. July 10, 1973, 2 claims).

A filter for cleaning exhaust fumes from a combustion device such as an internal combustion engine is described which avoids filter obstruction associated with prior art exhaust cleaning devices. Obstruction by exhaust deposition is avoided by utilizing filtering action in two directions of flow. The engine air intake passes through the filter in one direction, and the exhaust fumes pass through the filter in the opposite flow direction. Thus exhaust deposition on the filter is blown free through the air intake, and incompletely catalyzed substances are recirculated to the combustion chamber for total oxidation. The filter is especially effective when it passes continuously between exhaust and air intake ports such that the filter surface areas are interchangeably exposed in either direction.

58257

APTIC NO. 76524

Bazes, Joe G. I., L. S. Caretto, and Ken Nobe

CATALYTIC REDUCTION OF SULFUR DIOXIDE WITH CARBON MONOXIDE ON COBALT OXIDES. *Ind. Eng. Chem. Prod. Res. Develop.*, 14(4):264-268, Dec. 1975. 11 refs.

The reduction of sulfur dioxide with carbon monoxide on perovskite (LaCoO_3), mixtures of ceric oxide and cobalt-cobaltous oxide, and mixed oxide (CuCo_2O_4) catalysts was investigated between 284 and 465 C, initial SO_2 concentrations between 700 and 1400 ppm, and CO concentrations between 1 and 3 times the stoichiometric amount for complete reduction. Ninety percent reduction of SO_2 or greater was obtained for temperatures above 380 C and CO concentrations of 2.5 times the stoichiometric value. However, substantial carbonyl sulfide was not produced at high temperatures and large excess of CO. Carbon disulfide was not detected. Formation of COS was lessened by decreasing CO to SO_2 initial concentrations to the stoichiometric ratio. The catalytic activity of mixed CeO_2 and Co_3O_4 was greater than that of CuCo_2O_4 or LaCoO_3 . The experimental data were correlated with a power law rate equation and an analysis scheme to account for pore diffusion effects. (Author abstract)

58258

APTIC NO. 82030

Beaudoin, Gordon, Lawrence R. Foote, Jerome F. Hough, and Stanley R. Merchant

EXHAUST GAS AIR FUEL RATIO SENSOR. (*Ford Motor Co., Dearborn, Mich.*) U. S. Pat. 3,911,386. 6p., Oct. 7, 1975. 3 refs. (Appl. Jan. 15, 1975, 4 claims).

A titania exhaust gas air-fuel ratio sensor that is responsive to variations in the partial pressure of oxygen is described. The sensor allows for the maintenance of a selected operating temperature of the active section without the use of thermocouple control techniques. The device consists of a multi-layered ceramic exhaust sensor body which has an active variably resistive titania section sandwiched between a pair of heater sections. The active titania section consists of a pair of resistance sensing leads disposed within a wafer or disc-like body of titania ceramic material. Each of the heater sections is composed of a length of heater wire embedded within a ceramic wafer made of alumina. The two heater sections and the active titania section are formed from green ceramic material and are co-fired into a unitary ceramic body. The heater sections are connected electrically in series and may also be connected to an electronic heater control circuit responsive to the heater resistance for maintaining the current flow through the heater wires at a level which provides for the maintenance of the heater sections and the active titania section at a selected temperature.

58259

APTIC NO. 82854

Beavon, David K.

PROCESS FOR THE CONVERSION OF HYDROGEN SULFIDE IN GAS STREAMS OF LOW HYDROGEN SULFIDE CONCENTRATION TO SULFUR. *Parsons (Ralph M.) Co., Los Angeles, Calif.* U. S. Pat. 3,880,986. 6p., April 29, 1975. 5 refs. (Appl. July 9, 1973, 13 claims).

A gas stream is indirectly heated to a temperature sufficient for the catalytic conversion through elemental sulfur by reaction with sulfur dioxide by the Claus process. Simultaneously, an SO_2 containing gas stream is generated by combustion of sulfur with an oxygen containing gas in a flame zone. The S is present in excess of that required to meet the SO_2 requirements of the gas stream. Following recovery of excess S from the combustion products from the flame zone, the gas streams are combined and pass over one or more Claus catalyst conversion stages where S is formed by reaction of H_2S with SO_2 and recovered between each stage. In contrast to general practice, this process is applicable to acid gases containing less than 20% by vol H_2S . (Author abstract modified)

58260

APTIC NO. 82888

Beavon, David K.

PROCESS FOR THE REMOVAL OF HYDROGEN CYANIDE FROM GAS STREAMS. (*Parsons (Ralph M.) Co., Los Angeles, Calif.*) U. S. Pat. 3,878,289. 6p., April 15, 1975. 12 refs. (Appl. Aug. 24, 1972, 18 claims).

A process for eliminating oxygen cyanide contained in gas streams such as coke oven gas streams is described. The HCN is catalytically hydrolyzed in the presence of water to ammonia using as the catalyst one or more of the alkali metal hydroxides supported on alumina, alumina-silica, or silica. The ammonia formed is readily separated from the gas stream by any conventional technique. When unsaturated hydrocarbons and oxygen are present in the treated gas stream, the gas stream may be hydrogenated to eliminate oxygen and at least partially saturate the unsaturated hydrocarbons to prevent catalyst degradation. Other processes have the disadvantage of high capital cost, high costs of reagents, high toxicity, and the necessity of discarding the solutions due to the formation of sodium thiocyanate and sodium thiosulfate. (Author abstract modified)

58261

APTIC NO. 80106

Becker, K. P. and Clarence J. Wall

INCINERATE REFINERY WASTE IN A FLUID BED.

Hydrocarbon Process., 54(10):88-93, Oct. 1975. 4 refs.

The design and operation of a fluid bed incinerator for refuse wastes is discussed. Design parameters include size, bed type, operating temperature, heat recovery, and stream contaminations. Operating problems incurred in several installations center on the selection of proper bed temperatures and composition, heat exchange, and waste water disposal. Ash carryover and vaporized compounds deposit in the transfer line and on the exchange surface. Relatively soft ash deposits build up in the hot gas side of the gas heat exchanger tubes. A possible cause is a small amount of liquid phase in the fine ash in the incinerator exit gases which causes dust to stick to exchange surface.

58262

APTIC NO. 83632

Becker, R., K. Hess, and A. Stoeckel

SOOT-FREE, LOW-NOISE BURNING OFF OF HYDROCARBON-CONTAINING WASTE GASES IN FLARES. (*Russfreies und geraeuscharmes Abfackeln kohlenwasserstoffhaltiger Abgase*). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 232:227-233, 1975. 2 refs.

Steam injector bars for soot-free, low-noise burning of waste gases in torches are described along with the theoretical considerations on the possibilities to abate noise and soot emissions. Injector bars form a combined mixing and combustion chamber, thereby providing for a stable and low-noise combustion. Injector bars provide for a distinct separation of air suction and mixing, which counteracts the influence of high wind speeds on the combustion process.

58263

APTIC NO. 83778

Becker, Rolf, Klaus Hess, and Alfred Stoeckel

SOOT FREE AND LOW NOISE INCINERATION OF HYDROCARBON CONTAINING WASTE GASES IN A FLARE. (Russfreies und gerauscharmes Abfackeln kohlenwasserstoff-haltiger Abgase). Text in German. *Chem.-Ing.-Tech.*, 47(1):33, 1975. (The full-length text can be obtained from: Verlag Chemie GmbH, Weinheim, Postfach 1260, West Germany).

A flare consisting of injector rods for soot-free and low noise incineration is described and compared with three other injector systems. For incineration in a flare, oxygen and steam are introduced into the waste gas stream to eliminate soot and to propel the flow of waste gas, respectively. The flare with injector rods eliminates high steam consumption and noise and gives a soot free and stable flame. Advantages of the injector rod system in comparison with the normal injector, Coanda nozzle, and the split ring nozzle are discussed. Installation of injector rods in two 2 ton propylene/hr flares, one with soot-free flame and the other with dim flame, required 0.5 to 0.6 kg steam/kg gas and 0.85 to 1.0 kg steam/kg gas, respectively, and had noise levels that were lower than conventional flares by 13.5 db and 14 db, respectively, at 10 m distance.

58264

APTIC NO. 82610

Beckman, E. B. and C. Peleciur

AN AMMONIA SCRUBBING SYSTEM FOR INDUSTRIAL PLANTS. Preprint, Foster Wheeler Energy Corp., Livingston, N. J. and Weirittam, Levallois-Perret (France), 31p., 1975. 2 refs. (Presented at the American Power Conference, Chicago, Ill., April 22, 1975.)

Results from laboratory, pilot, and field tests of a double alkali ammonia scrubbing system for the desulfurization of industrial boiler flue gases and other process streams are presented. A total of 16 mo of operation on a slip stream equivalent to 25 mW of flue gas from a power station in France revealed a sulfur dioxide removal efficiency of between 90 and 97% for SO₂ inlet concentrations of between 1100 and 1800 ppm (by volume). The system was also effective in removing particulate matter, although no specific measurements were made on the flue gas side. After modifications to the system, an 86% availability was achieved. The capital costs of the system amounted to \$2165/lb SO₂ removed/hr for a boiler flue gas stream with an inlet SO₂ concentration of 2650 ppm (by volume) and \$750/lb SO₂ removed/hr for a process gas stream with an inlet SO₂ concentration of 20,000 ppm (by volume). The operating costs for the above two cases were 43 and 42 mills/lb SO₂ removed, respectively.

58265

APTIC NO. 82223

Bell, Christy W., John K. Wittle, and Arthur L. Speece

ELECTROLYTIC OIL PURIFYING METHOD. (Electro-Petroleum, Inc., Bryn Mawr, Pa.) U. S. Pat. 3,915,819. 4p., Oct. 28, 1975. 3 refs. (Appl. July 3, 1974, 5 claims).

Sulfur is removed from liquid hydrocarbon oils such as crude oil by subjecting a mixture of the oil and an ion-producing compound to a direct current field for causing electrochemical reaction of the sulfur or sulfur-containing material enabling ready separation and removal of the sulfur from the oil. The ion-producing compound may be either an inorganic electrolyte or an ionizing organic solvent. The electrical field generally has a voltage in the range of about 2 to 120 volts and a current of between 0.001 to 25 ampere/sq cm, with a preferred voltage range of about 2 to 10 volts in most cases. (Author abstract modified)

58266

APTIC NO. 76530

Bell, Z. G., Jr., J. C. Lafleur, R. P. Lynch, and G. A. Work

CONTROL METHODS FOR VINYL CHLORIDE. *Chem. Eng. Progr.*, 71(9):45-47, Sept. 1975.

Control methods for vinyl chloride monomer (VCM) in operations of two vinyl chloride facilities are described. One technique involves sample collection and analysis. Quality control sample collection is achieved from different points in the system by attaching the sample cylinder or bomb to a small fitting in a closed loop system. Another procedure involves loading operations for tank cars, tank trucks, barges, and ships. The potential problem areas are sampling, vehicle emissions, vehicle gauging, and loading line clearing. The oxygen content of empty transportation vehicles is determined prior to loading, and the oxygen analyzer is vented remotely so that personnel exposure is avoided. There are equalizing lines so that vehicle vapor content may be displaced during loading.

58267

APTIC NO. 76058

Bellegia, F. L., J. C. Mathews, R. E. Paddock, and M. M. Wisler

UPDATE AND IMPROVEMENT OF THE CONTROL COST SEGMENT OF THE IMPLEMENTATION PLANNING PROGRAM (FINAL REPORT). Research Triangle Inst., Research Triangle Park, N. C., Office of Air and Waste Management Contract 68-02-0607, Program Element 2AC129, Rept. EPA-450/3-75-058, 148p., Feb. 1975. 41 refs.

NTIS: PB 245834/AS

Particulate matter and sulfur dioxide control equipment applicable to each Standard Industrial Classification Process Code are identified along with typical removal efficiencies and capital and operating costs. The cost data generated for particulate control devices are related to the specified device at three levels of pollutant removal efficiency (high, intermediate, and low); sulfur dioxide control costs are determined at one specified level of removal capability. Tandem control arrangements are also considered. Algorithms are developed for estimating the costs associated with installing and operating each particular control configuration. (Author abstract modified)

58268

APTIC NO. 82829

Benedict, John W.

CATALYTIC METHOD OF PURIFICATION OF AIR FOR MOTOR VEHICLE PASSENGER COMPARTMENT. (Girdler Chemical, Inc., Louisville, Ky.) U. S. Pat. 3,883,637. 5p., May 13, 1975. 18 refs. (Appl. June 25, 1973, 6 claims).

A method for removing odorous organic sulfur compounds and harmful gases from the air entering a motor vehicle passenger compartment through a ventilation conduit system is described. A filter element containing combined copper and combined chromium on activated charcoal is effective at high space velocities. Conventional filter elements which contain only activated charcoal are not effective in removing sulfur compounds at the very high space velocities of the air within the filter element.

58269

APTIC NO. 81004

Beningson, R. M., K. J. Rogers, T. J. Lamb, and R. M. Nadkarni

PRODUCTION OF ECO-FUEL R-II FROM MUNICIPAL SOLID WASTE CEA/ADL PROCESS. Combustion Equipment Associates, Inc., Resources Recovery Div. and Little (Arthur D.), Cambridge, Mass., Convers. Refuse Energy Int. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 14-21. (Nov. 3-5.)

The properties of Eco-Fuel R-II produced from municipal solid waste are described. Eco-Fuel R-II is a fine dry, free flowing powder with a high bulk density and low ash content. These properties facilitate storage, handling, and transportation of the fuel to the consumer. The fineness of grind and the uniformly high Btu content facilitate combustion control and result in a complete burning of the organics. The fuel is flexible, it can be briquetted or slurried in residual oil. For oil

CONTROL METHODS

58275

burning utilities the slurries are particularly attractive as it avoids the necessity of handling a solid fuel. The fuel is ideally suited as a feedstock for pyrolysis.

58270

APTIC NO. 80479

Benson, R. S., P. C. Baruah, and B. Whelan

SIMULATION MODEL FOR A CRANKCASE-COMPRESSION TWO-STROKE SPARK-IGNITION ENGINE INCLUDING INTAKE AND EXHAUST SYSTEMS. *Proc. Inst. Mech. Engrs. (London)*, 189(7):167-175, 1975. 13 refs.

A simulation model for a crankcase compression two stroke spark ignition engine was developed which includes intake and exhaust systems. Chemical equilibrium and a two-zone combustion model with a spherical flame front are assumed for the power cycle, and generalized non-steady gas dynamic expressions, including variable composition, variable specific heats, friction and heat transfer, are assumed for the gas exchange process in the intake and exhaust systems. For the scavenge process in the cylinder, a thermal mixing model is used to calculate the pressure changes. Experiments with a small high speed engine show that the model gives good predictions of the pressure changes during the gas exchange process and the air flow rate. The power predictions follow the experimental trend, but the quantitative results are not as good as the air flow predictions. (Author abstract modified)

58271

APTIC NO. 83094

Berg, Roy E.

INDUSTRIAL SCRUBBER. (Interstate Utilities Corp., Miami, Fla.) U. S. Pat. 3,870,484. 16p., March 11, 1975. 19 refs. (Appl. June 13, 1972, 5 claims).

An industrial scrubber is provided comprising a plurality of vertical, thick-walled, scrubber tubes which are removably mounted in a support base and arranged in a staggered relationship with respect to the direction of flow of a gas stream conveyed and circulated through the scrubber. The scrubber also includes means for supplying water up through the scrubber tubes so that the water is forced out of their tops and flows down over the outer surfaces of the tubes, and means for removing contaminated water from the vicinity of the scrubber. Since the scrubber tubes are removably mounted, they can be readily and easily removed and replaced with a minimum loss of time in operation of the scrubber. (Author abstract)

58272

APTIC NO. 82492

Berger, Heinz and Heinz-Werner Berger

METHOD OF MAKING AN ANTIPOLLUTION CATALYST AND PRODUCT OF THE METHOD. (Assignee not given.) U. S. Pat. 3,894,968. 4p., July 15, 1975. 4 refs. (Appl. May 15, 1972, 4 claims).

The preparation of a catalyst for the decontamination of the exhaust fumes of an internal combustion engine is described. It is made by reducing a mineral mass to a submillimeter particle size and then combining it with an active metal component. The mixture is further comminuted in a colloid mill and combined with an aqueous solution of a noble metal salt to form a paste. The paste is shaped and fired at 800 C to 1050 C to form a catalyst body. Conventional systems are not able to sufficiently reduce the nitrogen oxide content of the gas and they lose their effectiveness relatively rapidly. They are found with 25,000 to 30,000 km to have an effectiveness reduced by 50% or more. This catalyst has a useful life of up to 80,000 km with retention of emission detoxification of 80%. The catalyst is highly effective for rapid starting of oxidation and elimination of NOx in the discharged gases. (Author abstract modified)

58273

APTIC NO. 82562

Bernard, Richard A. and Arthur A. Bernard

FILTER, PARTICULARLY FOR SMOKE SOLIDS FILTRATION. (Dover Corp., Memphis, Tenn.) U. S. Pat.

3,883,331. 12p., May 13, 1975. 5 refs. (Appl. Jan. 8, 1973, 12 claims).

A novel and improved filter for filtration of smoke and other very fine particulate material entrained in a gas is described. It is composed of a multiplicity of generally flat, closed envelopes of a material which is permeable to gas, but capable of trapping the particulate material and supporting a layer of the material as a filter bed. The gas to be filtered enters the filter element and is distributed among the envelopes. The particulate material is collected as a layer or bed on each wall of each envelope, and the gas flows out through the envelope walls. The filter is superior to the conventional cartridge filter which allows particles to penetrate into and clog the filter medium. Changing a cartridge type filter is a dirty job, and disposal of the used filter cartridge is a problem. (Author abstract modified)

58274

APTIC NO. 83823

Bernhardt, W., A. Koenig, and W. Lee

APPLICATION OF ALTERNATE FUELS IN STREET TRAFFIC. (Einsatz von alternativen Kraftstoffen im Fahrzeugverkehr). Text in German. VDI (Ver. Deut. Ingr.) Ber., (250):69-76, 1975. 8 refs.

Gasoline substitution by other fuels for automobiles is discussed. Such energy carriers would have to have the lowest possible energy weight in relation to the mass of the filled tank and the lowest possible energy volume in relation to the outer tank volume. The fuel would have to be usable under all, particularly atmospheric, conditions and storable over a long period of time; its transportation and distribution would have to be as economical as possible; and its handling should not involve greater safety hazards (fire, explosion, poisoning) than with today's fuels. Fuels derived from crude oil, shale and tar sand were about \$8.00/Gcal cheaper than those from coal-enriching processes with an average \$18.00/Gcal in cost. Production of methanol, synthetic natural gas, and synthetic liquid gas from coal have recently become more feasible economically. Methanol could be manufactured most cheaply by applying nuclear heat at a cost of \$10.00/Gcal at the tank station. Among all potential fuels, methanol would be particularly suitable as a substitute fuel. It could be carried like gasoline or diesel oil in a pressure-less tank, distributed at tank stations with the presently available equipment, and the change-over cost from gasoline power would run to about \$100 for cars. It is also toxicologically less hazardous than alternate fuels. Waste gas and operational handling would be improved compared to gasoline operation. As additive to gasoline (15%), a drastically reduced carbon monoxide emission, and improved hydrocarbon and nitrogen emissions and a better energy utilization in the engine would result. In 1980, 2.9 million tons of gasoline could thus be saved and 0.8 million more by better energy conversion in West Germany amounting to an economy of .5 billion dollars. A disadvantage in methanol use would be a doubling of the tank size, as compared to gasoline, higher H₂O emission, an eventual aldehyde emission and an additional advantage in starting at temperatures below 8 C.

58275

APTIC NO. 80092

Berry, M. A.

CONTROL OF EMISSIONS FROM OIL FIRED PLANTS.

Aust. Refrig., Air Cond., Heat., 29(8):50-53, Aug. 1975.

Methods for the control of emissions from oil fired plants are discussed. The methods range from correct fuel selection to chimney design and can effectively reduce most emissions to acceptable levels. The emission include: carbon dioxide, carbon monoxide, water vapor, soot, and unburnt hydrocarbons, emissions from process materials, sulfur dioxide, sulfur trioxide and acid smuts, and nitrogen oxides. The sulfur emissions are the most troublesome. Soot emission is associated with three factors: the presence of unburnt solids, the presence of SO₃ in the flue gases, and relatively low temperatures of surfaces in contact with these gases. Three methods can prevent acid deposit: combustion control, maintenance of surface tem-

peratures, and neutralization. The tall stack policy is successful in controlling ground level concentrations of SO₂ and nitrogen oxides.

58276

APTIC NO. 83961

Berti, V., A. Iannibello, and S. Marengo

PRETREATMENT OF PETROLEUM RESIDUES FOR CATALYTIC HYDRODESULFURIZATION.

(*Pretrattamento dei residui di petrolio di alimentazione alla idrodesolforazione catalitica*). Text in Italian. Riv. Combust., 29(4):121-134, April 1975. 15 refs.

Pretreatment of high-sulfur residual oils over natural or synthetic high-porosity materials to absorb the metals contained facilitates the subsequent hydrodesulfurization of the residues and extends the life of the desulfurization catalysts. Laboratory tests were conducted on a North American bauxite having a large surface area. A first set of tests was run on thermally activated bauxite and a second on the same material treated with superheated steam. Factors taken into consideration were the quantity of vanadium retained by the bauxite, the decomposition kinetics of the vanadium-containing metal-organic complexes, and the extent of residue desulfurization by the bauxite. The residues were hydrodesulfurized using conventional catalysts to compare them with untreated residual oils. Results confirmed the satisfactory performance of bauxite with a large surface area for metals removal and its advantages in the subsequent hydrodesulfurization. The substances produced were characterized by a lower content of sulfur metals (average, 5-10 ppm of vanadium, compared to 20-25 ppm without bauxite in the treatment) and by a better ratio of medium-weight and heavy distillates and residue.

58277

APTIC NO. 83396

Bertodo, Roland and Pierre Chambrillon

CONTRIBUTION OF THE PERKINS GROUP TO NUISANCE CONTROL. (*Contribution du groupe Perkins a la lutte contre les nuisances*). Text in French. Ingrs. Automobile (Paris), no. 3-4:97-107, March 1975.

A control method for high rate exhaust gases from small diesel motors that does not affect their performance has been developed in the Squish Lip combustion system. Direct injection motors with a charge rate of up to 150 kW require delayed injection to reduce nitrogen oxide emissions. With delayed injection, the time available for combustion leads to the wasting of a significant quantity of flammable mixture in the exhaust. Encouraging results have been achieved by reducing the size of the opening while maintaining the volume by increasing depth or diameter; nitrogen oxide values were lower than 4 g/bhp/h with the CARB 13 cycle for smoke levels of about 2.5 Bosch. The Squish Lip system has an optimum dynamic injection shift of 8 deg before high dead point so that output is 7% superior to that of a conventional direct injection motor. Nitrogen oxide and hydrocarbon content with the CARB 13 cycle is about 7.5-8 g/bp/h and the smoke index does not exceed 7.5%. By delaying dynamic shift at 3 deg before high dead point, the output is reduced to a value comparable to that measured in a direct injection motor, but the nitrogen oxide and hydrocarbon content is reduced to less than 5 g/bh/h with an opacity of 5%. Global thermal output is 31.5% for a weak emission injection shift. This output reaches 33.4% for a corresponding shift at minimum consumption, compared to 32.5% for an actual direct injection motor. Combustion is clearly better at low feeding but deteriorates as the feeding increases. This degradation occurs at levels sufficiently high to conserve a better consumption than in an indirect injection motor. Although the Squish Lip reduced by hydrocarbon levels and eliminated odor, it cannot reduce opacity of the smoke without deteriorating noxiousness.

58278

APTIC NO. 82659

Bertsch, Joseph F.

CATALYTIC CONVERTER. (*General Motors Corp., Detroit, Mich.*) U. S. Pat. 3,879,944. 4p., April 29, 1975. 1 ref. (Appl. March 20, 1974, 2 claims).

A catalytic converter is described which has a cylindrical can with open ends. Exhaust gases admitted through one end may flow through a first catalyst bed to openings in the side wall of the can or through the narrow end of a funnel shaped container projecting through an opening in the center of the first catalyst bed. A second catalyst bed, coaxial with the first, is placed in the wide end of the funnel shaped container to increase the catalyst bed flow area. A housing containing the can through which the exhaust gases flow upon emerging from the beds, to increase heating of the catalyst beds for faster catalyst warm-up. (Author abstract modified)

58279

APTIC NO. 82979

Berz, Max and Wolfgang Berz

DUST FILTER ARRANGEMENT. (*Wolfgang Berz, Kochel am See (Federal Republic of Germany)*) U. S. Pat. 3,871,846. 18p., March 18, 1975. 16 refs. (Appl. April 1, 1974, 5 claims).

A dust filter arrangement for purifying process gases in chemical plants is described. A battery of filter chambers, each divided into an upper and a lower compartment by a filter bed of granular material supported on a foraminous sheet has a purified gas manifold permanently communicating with the several lower compartments. There are valves associated with respective upper compartments for alternatively connecting the upper compartments with a raw gas intake or a scavenging gas discharge conduit. A preliminary separator in the intake removes suspended coarse particles from the raw gas, and a separator in the scavenging gas discharge conduit separates solid particles from the scavenging gas flowing from the upper compartment. The suction port of a circulating fan is connected to the scavenging gas conduit, and its pressure port is connected to the raw gas intake. An exhaust fan draws raw gas into the intake and discharges purified gas from the manifold. Unlike other filters, this filter is capable of operating continuously at uniformly high effectiveness, yet requires relatively little space. (Author abstract modified)

58280

APTIC NO. 82973

Berz, Wolfgang

APPARATUS FOR SEPARATING SUSPENDED PARTICLES FROM A CARRIER GAS. (*Assignee not given.*) U. S. Pat. 3,897,228. 6p., July 29, 1975. 12 refs. (Appl. Aug. 28, 1974, 10 claims).

An apparatus for separating suspended particles from a carrier gas is described. A battery of filter chambers, each separated into two compartments by a horizontal layer of particulate filter medium, is operated partly in a filtering mode. Dust laden carrier gas passes downward through the filter medium from a valve opening into the upper compartment and partly in a purging mode in which clean gas purified in other chambers passes upward through the medium. It flows through an upright pipe and passes downward through the lower compartment into a purging gas manifold. The lower end of the upright pipe is closed by a valve in the filtering operation. The lower compartment is permanently open to a clean gas manifold. This arrangement eliminates the problems in other devices which need to be shut down and cleaned of dust accumulating in purging gas conduits. (Author abstract modified)

58281

APTIC NO. 80104

Beychok, Milton R.

ENVIRONMENTAL FACTORS IN PRODUCING SUPPLEMENTAL FUELS. (*Hydrocarbon Process.*, 54(10):78-81, Oct. 1975. 13 refs.

An overall summary of environmental factors involved in producing the supplemental fuels naphtha synthetic natural gas, LNG, crude oil synthetic natural gas, shale oil, coal SNG, coal liquefaction, and methanol is presented. Potential sulfur dioxide emissions from all sources within the plants include sulfur recovery tail gas, process vents, and combustion stack gases. Most of the plants release sulfur emissions of about 1.5

CONTROL METHODS

to 3% of the plant input S, which means 97 to 98.5% of the input S is recovered in some form or retained by by-products. Combustion stack gases from boilers, heaters, and gas turbines are the primary sources of nitrogen oxides emissions within all the plants. Although fuel nitrogen content affects NOx emissions to a degree, the primary control of NOx formation is by the use of modified combustion conditions.

58283

APTIC NO. 76484

Bibbo, P. P. and M. M. Peacos

USE HOT-SIDE PRECIPITATOR WITH CO BOILER WASTE HEAT RECOVERY. *Hydrocarbon Process.*, vol. 1975:149-150, Sept. 1975. 1 ref.

The use of a hot side precipitator with carbon monoxide boiler waste heat recovery is discussed. Hot temperature precipitator design offers advantage in sizing and better reliability in determining the resistivity of the particles which allows for more precise designs. For a typical installation handling 100,000 acfm (hot) from a CO boiler, a cold system needs as much as 15% more collecting area depending on the required dust collecting efficiency. Hot side electrostatic precipitators are installed in the system before the waste heat recovery equipment. Operating at temperatures from 600 to 800 F, they are capable of collecting particulates down to submicron size with 98+% collection efficiency, well above industry standards.

58283

APTIC NO. 80347

Bidwell, Robin and Sandra Mason

FUEL FROM LONDON S REFUSE: AN EXAMINATION OF ECONOMIC VIABILITY. *Environmental Resources Ltd., London (England), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 596-601. 2 refs. (Nov. 3-5.)*

The separation out from refuse of the combustible fraction for use as a solid fuel in industrial boilers is a relatively recent development. The issues that must be investigated before the economic viability of a refuse derived fuel (RDF) scheme can be determined are discussed. Common elements of the various fuel production processes are the shredding of refuse followed by a primary separation stage, usually by air classification, into light (combustible) and heavy fractions, and a system for extracting ferrous metals. The amount and the calorific value of the RDF produced are determined by the nature of the refuse available for processing. Usually only the substantial users of fuel are likely to be interested in switching to RDF, since only they have the ability to use enough to compensate in fuel cost saving for the overhead element in the modification to firing equipment. Transport costs will probably be a significant element in the net cost of the system as a whole. The cost for a London based RDF system are indicated in tabular form. The net cost of RDF production is very sensitive to the variables discussed.

58284

APTIC NO. 82742

Bischoff, W. F. and J. S. Cvicker

SULFUR RECOVERY FROM SO₂ - THE FW-BF SYSTEM. Preprint, Purdue Univ., West Lafayette, Ind., 20p., 1975. 3 refs. (Presented at the Purdue Air Quality Conference, Annual, 14th, Indianapolis, Ind., Nov. 12-13, 1975.)

A dry, regenerable adsorption system for the desulfurization of flue gas is described along with field test results. The system is known as the Foster Wheeler-Bergbau-Forschung Dry Adsorption System and not only removes sulfur dioxide from flue gas but also allows for the recovery of elemental sulfur. The adsorption section of the system contains char in a series of modules acting in parallel, and the flue gas is introduced by means of fixed angle louvers. Char moves continuously downward in mass flow, while the flue gas passes across the moving bed in cross flow. The combination of moving char and flowing flue gas gives rise to the reaction of sulfur dioxide with oxygen and water to produce sulfuric acid.

Regeneration is achieved in a second section by contacting the loaded char with hot sand. In a third section, a concentrated stream of SO₂ is introduced in counterflow to a mass flow of crushed coal in a refractory-lined carbon steel reactor vessel to produce carbon dioxide and elemental sulfur. Field tests indicate SO₂ removal efficiencies of between 75 and 100%, and the sulfur produced is of commercial grade purity (99.7%). Availability of the system is almost 100%.

58285

APTIC NO. 82004

Bittelmeyer, Hans

FUEL INJECTION PUMP FOR INTERNAL COMBUSTION ENGINES. (Robert Bosch GmbH, Stuttgart (Federal Republic of Germany) U. S. Pat. 3,908,619. 5p., Sept. 30, 1975. 6 refs. (Appl. Oct. 3, 1974, 1 claim).)

A fuel injection pump mechanism employing a simultaneously reciprocating and rotating metering piston is provided with relief channels which permit the equalization of the residual pressures in the various sequentially addressed fuel delivery lines leading to the engine cylinders. For this purpose, the pump piston is provided with a partial annular groove which connects the idle fuel delivery channels with one another. A longitudinal groove further connects these channels to the working pressure chamber of the fuel injection pump. The longitudinal groove can be separated by a check valve from the working chamber of the pump and extends within the pump housing. The connecting channel within the pump housing has a first outlet aperture in the pump cylinder, located in the vicinity of the effective region of the annular groove in the piston. The connecting channel also has a second outlet aperture leading into the pump cylinder which may be opened during the suction stroke of the piston by one or several longitudinal grooves distributed around the pump piston periphery and corresponding in number to the number of fuel distributing channels. (Author abstract modified)

58286

APTIC NO. 83374

Bjorkling, Holger

IMPROVING THE WORST WORKING ENVIRONMENT. (Gruvans arbetsmiljo forbatras). Text in Swedish. *Tek. Tidskr.*, 105(10):26, 29, 33, 35, May 1975.

The basic problems of occupational hygiene and recent results achieved in this area in Swedish mines are reviewed. It was possible to considerably reduce the toxicity and carbon monoxide content of the blast gases by the replacement of nitroglycerin and other conventional explosives by Iremite (Kimit). Silicosis is now a rare occupational disease due to efficient ventilation and the use of water during drilling and other operations. Still further efforts will have to be made, especially concerning the abatement of the diesel exhaust gases. While the replacement of diesel-powered equipment by non-polluting units will take a long time, it is possible to reduce the hydrocarbon and carbon monoxide content of diesel exhaust by catalytic afterburning on platinum catalyst. This catalyst has, however, the disadvantage of oxidizing nitric oxide to nitrogen dioxide.

58287

APTIC NO. 82575

Blazowski, W. S., F. S. Fahrenbruck, and L. P. Tackett

COMBUSTION CHARACTERISTICS OF OIL SHALE DERIVED JET FUELS. Preprint, Combustion Inst., Pittsburgh, Pa., 24p., 1975. 3 refs. (Presented at the Combustion Institute, Western States Section, Fall Meeting, Palo Alto, Calif., Oct. 20-21, 1975, Paper 75-13.)

The combustion characteristics of jet fuels derived from oil shale were examined during combustor rig and engine tests. Neither JP-4 nor JP-5 fuels produced by the refining of oil shale syncrude completely met specification requirements, although the JP-4 fuel met all specifications when processed by clay filtration. The higher fuel nitrogen content of both oil shale fuels resulted in slightly increased nitrogen oxide emissions. Hydrocarbon and carbon monoxide emissions from the

oil shale fuels were comparable to those from conventional JP-4 and JP-5 fuels. Increased smoke emissions were observed during the testing of oil shale JP-5. Tests using oil shale and petroleum JP-4 fuels in an afterburning J85-5 turbojet engine showed no performance differences, although NOx emissions were slightly increased during idle operation when the oil shale fuel was used. The NOx emission index for the latter was 1.6 at idle as compared to 1.0 for petroleum JP-4 fuel. A successful flight involving a T-39 aircraft fueled with clay treated oil shale JP-4 was accomplished. (Author abstract modified)

58288

APTIC NO. 82576

Blazowski, W. S.

AIRCRAFT ALTITUDE EMISSIONS: FUNDAMENTAL CONCEPTS AND FUTURE R AND D REQUIREMENTS. Preprint, American Inst. of Aeronautics and Astronautics, New York, 19p., 1975. 47 refs. (Presented at the American Institute of Aeronautics and Astronautics, 1975 Aircraft Systems and Technology Meeting, Los Angeles, Calif., Aug. 4-7, 1975, Paper 75-1017.)

The current understanding of aircraft altitude emissions is reviewed along with future research and development requirements for their control. Among the pollutants whose concentrations are controlled by the combustion process, nitric oxide is the most vital and perhaps the only important species that is emitted during the cruise stage. Currently available control technology can reduce cruise nitrogen oxide emissions by less than 50%. Techniques currently being developed include fuel-air premixing and lean burning. Cruise NOx levels down to about 7 g/kg fuel can be expected. Techniques involving premixed, prevaporized, lean combustion or catalytic combustion may be necessary to approach NOx levels of 0.3-0.5 g/kg fuel. Hydrogen and methane fuels appear to offer the possibility of reduced emissions, while fuels refined from coal, oil shale, or tar sands may make emission control more difficult. (Author summary modified)

58289

APTIC NO. 82413

Blitzer, Sidney M.

SO2 REMOVAL FROM GASES. (Ethyl Corp., Richmond, Va.) U. S. Pat. 3,890,431. 5p., June 17, 1975. 4 refs. (Appl. Oct. 4, 1973, 10 claims).

A process for recovering sulfur dioxide from gaseous mixtures is described. It involves reacting SO2 or a system containing SO2 with carboxymethoxysuccinic acid or a water soluble salt to form an aqueous solution complex containing SO2 and carboxymethoxysuccinic acid or a water soluble salt. The complex is treated to remove the sulfur and regenerate the carboxymethoxysuccinic acid or water soluble salt, providing a cyclic process. The provision of an SO2 collection process using a new, effective, low cost absorbent material is an improvement over known prior art absorbents which are expensive. (Author abstract modified)

58290

APTIC NO. 81995

Boehm, Eberhard, Lothar Reh, Ernst Weckesser, Gunter Wilde, and Guenter Winkhaus

METHOD OF REMOVING HF FROM GASES. (Metallgesellschaft Aktiengesellschaft, Frankfurt am Main (West Germany) and Vereinigte Aluminiumwerke Aktiengesellschaft, Bonn (West Germany)) U. S. Pat. 3,907,971. 8p., Sept. 23, 1975. 5 refs. (Appl. Nov. 15, 1971, 3 claims).

A method for removing hydrogen fluoride from gas streams emitted by electrolysis cells used for the production of aluminum is described wherein contact between the gas phase and the solid phase is carried out in an expanded fluid bed to achieve increased removal efficiency over prior art methods. The waste gas is used as the fluidizing medium for an expanded fluid bed of particulate solids capable of taking up hydrogen fluoride. The solids content of the fluid bed chamber and the gas flow parameters are adjusted to maintain a con-

tinuous solids concentration gradient throughout a vertical chamber such that the concentration decreases from the bottom to the top of the chamber. A major proportion of the solids removed from the top of the bed and entrained in the gases can be separated from the effluent gas and returned to the chamber.

58291

APTIC NO. 81994

Boening, Guenter

PROCESS FOR REMOVING SULFUR DIOXIDE FROM GAS STREAMS CONTAINING SAME AND ESPECIALLY FURNACE AND CHEMICAL PLANT WASTE GASES. (Metallgesellschaft Aktiengesellschaft, Frankfurt am Main (West Germany)) U. S. Pat. 3,907,970. 7p., Sept. 23, 1975. 5 refs. (Appl. July 9, 1973, 1 claim).

A catalytic method for removing sulfur dioxide from gas streams is described which requires no prepurification of the gas to avoid dust contamination of the catalyst. The waste gas is passed upwardly through a replaceable lower bed of a carbon-containing catalyst and a nonreplaceable upper bed of carbon-containing catalyst in counterflow to water or dilute sulfuric acid sprayed onto the catalyst from above. The SO2-containing gas is cooled by direct contact with the sulfuric acid drained from the beds before the gas encounters the catalyst. This sulfuric acid is then concentrated by the evaporation of water therefrom. The lower catalyst layer can be replaced by withdrawing trays containing the catalyst material from the reactor.

58292

APTIC NO. 76415

Boersma, M. A. M.

CATALYTIC AFTERTREATMENT OF EXHAUST GASES. (Katalytische nabehandeling van uitlaatgassen). Text in Dutch. Polytech. Tijdschr. Ed. Procestechiek (The Hague), 30(13):429-434, June 1975. 15 refs.

Alternative automobile power plants, possible improvements on conventional engines for exhaust emission abatement, and thermal and catalytic exhaust cleaning systems are described. Compared with conventional gasoline engines, Wankel engines generate less nitrogen oxides, and about the same amount of carbon monoxide and hydrocarbons. While Rankine and Stirling engines represent no competition for conventional engines, the chances of battery powered automobiles are restricted to downtown areas with critical air pollution levels. In conventional engines, the CO, nitrogen oxides, and unburnt hydrocarbon emissions can be reduced by using very low air-fuel ratios over 20. Exhaust gas recirculation, water injection into the engine or into the exhaust gas, stratified charge engines, and Compound Vortex Controlled Combustion are among the major achievements in the area of engines with cleaner exhaust. Thermal afterburning between 800 and 1200 C, possibly combined with partial exhaust gas recirculation, reduces the nitrogen oxides, CO, and hydrocarbon emissions. Catalytic exhaust cleaning is possible in dual catalyst converters, composed of a first stage for the reduction of nitric oxide in the presence of hydrocarbons, CO and hydrogen, and of a second stage in which CO and hydrocarbons are oxidized to carbon dioxide and water. Single catalyst converters for the simultaneous destruction of CO, nitrogen oxides, and hydrocarbons are being studied.

58293

APTIC NO. 81618

Boersma, M. A. M.

CATALYTIC AFTERTREATMENT OF EXHAUST GASES. PART 6. 3. KINETICS AND MECHANISM OF SOME IMPORTANT REACTIONS. (Katalytische nabehandeling van uitlaatgassen 6. 3. kinetiek en mechanismen van enkele belangrijke reacties). Text in Dutch. Polytech. Tijdschr., Ed. Procestechiek (The Hague), 30(17):561-566, Aug. 1975.

Studies on the chemisorption of nitric oxide, nitrous oxide and carbon monoxide, of the oxidation of CO and hydrocarbons,

and of the reduction of NO in catalytic exhaust cleaning devices are reviewed. The reduction of NO with CO, with carbon dioxide and nitrogen as reaction products, is determined kinetically by the chemisorption of NO, and the catalytic activity for this reaction decreases in the order iron oxide, copper oxides, chromium oxide, nickel oxide, platinum, cobalt oxide, alumina, manganese oxide, and vanadium pentoxide. Nitrous oxide, a by-product of the NO reduction, is formed mainly at temperatures near the thermal threshold of the reduction reaction. Copper oxides, cobalt oxide, ferric oxide, manganese dioxide, platinum, and nickel oxide are the best catalysts for the oxidation of CO. Platinum, palladium, chromium, manganese, cerium, cobalt, iron, and nickel are best for the oxidation of hydrocarbons.

58294

APTIC NO. 84271

Boersma, M. A. M.

CATALYTIC AFTERTREATMENT OF EXHAUST GASES. PART 4. 2. CATALYSTS FOR EXHAUST GAS CLEANING: REQUIREMENTS, PREPARATION AND DEACTIVATION. (*Katalytische nabehandeling van uitlaatgassen 4. 2. katalysatoren voor het reinigen van uitlaatgassen: eisen, vormgeving en deactivering*). Text in Dutch. *Polytech Tijdschr, Ed Procestechiek (The Hague)*, 30(15):499-503, July 1975.

General requirements for catalysts to be used for catalytic exhaust gas cleaning are discussed. Oxides of copper, chromium, manganese, iron, cobalt, and nickel, combinations of two or more of these oxides, platinum, palladium, rhodium, and ruthenium are used as exhaust cleaning catalysts. The catalytic activity can be improved by the addition of promoters, such as alkaline earth metals and rare earth elements. Bifunctional exhaust cleaning devices, using a mixture of non-precious metal oxides and a precious metal, are suitable for the oxidation of carbon monoxide and hydrocarbons, and for the reduction of nitric oxide. Oxidation catalysts should have a high temperature response to be able to oxidize the large quantities of CO and hydrocarbons generated at start-up. Highly selective catalysts are required to prevent ammonia formation during the reduction of NO. A conversion rate of 100% can be reached for NO under air deficiency conditions.

58295

APTIC NO. 76360

Bogatie, C. F. and R. S. Saltzman

A SURVEY OF CONTINUOUS MONITORING OF STACK EMISSIONS FROM KRAFT MILLS. *TAPPI*, 58(10):81-84, Oct. 1975. (Presented at the Technical Association of the Pulp and Paper Industry Environmental Conference, Denver, Colo., May 14-16, 1975.)

A survey of continuous monitoring of stack emissions from kraft mills was conducted. Thirty-seven United States mills in the South and Northwest were questioned, with only one not responding. Twenty-two report using at least one continuous monitor in their operations. Five have continuous particulate monitors only, eight have continuous gaseous monitors only, and nine use both types. Fifty percent of the particulate monitor users rate their application success as excellent, while only 22% of the gaseous monitor users indicate excellence. Most mills in the Northwest have both particulate and gaseous monitors because of present or imminent state and local air abatement laws requiring continuous air emission data.

58296

APTIC NO. 76580

Bohn, Hinrich L.

SOIL AND COMPOST FILTERS OF MALODORANT GASES. *J. Air Pollution Control Assoc.*, 25(9):953-955, Sept. 1975. 18 refs.

The use of soil and compost filters to absorb malodorant gases is discussed. The contaminated gas is taken from the source and blown out of a perforated pipe buried in a bed of soil or compost. As the gas passes through the bed, the soil or compost sorbs and oxidizes organic gases, hydrogen sulfide, sulfur

dioxide, ammonia, nitrogen oxides and other contaminants from the air. The oxidation products are carbon dioxide, water, sulfate, and nitrogen or nitrate, respectively. The filters are quite nonspecific and adapt to a wide range of air contaminants. The technique seems appropriate for the waste air from agricultural, food, and waste processing and for paper and chemical manufacturing. Earth filters could also be used as the final stage of air treatment to remove the low concentrations released by conventional physico-chemical scrubbing techniques.

58297

APTIC NO. 82563

Bolle, Daniel

INCINERATOR FOR DOMESTIC AND INDUSTRIAL SOLID, SEMI-LIQUID OR LIQUID WASTE.

(*Etablissement Manitra, Vaduz (Liechtenstein)*) U. S. Pat. 3,882,801. 8p., May 13, 1975. 4 refs. (Appl. Nov. 16, 1973, 5 claims).

An incinerator for domestic and industrial solid-semi-liquid or liquid waste was developed. It consists of a rotary oven in the shape of a truncated cone with fixed precombustion and/or post-combustion chambers at the ends of the oven. The waste is introduced into one of the chambers by means of a loader or feeder. The chambers are connected to a decanting cyclone by means of a gas exhaust pipe. The rotary chamber of the oven is rotatably driven continuously or intermittently through mechanical means. (Author abstract modified)

58298

APTIC NO. 82778

Borgwardt, Robert H.

INCREASING LIMESTONE UTILIZATION IN FGD SCRUBBERS. Preprint, *American Inst. of Chemical Engineers, New York*, 28p., 1975. 7 refs. (Presented at the American Institute of Chemical Engineers Annual Meeting, 68th, Los Angeles, Calif., Nov. 16-20, 1975.)

An experiment aimed at increasing limestone utilization in flue gas desulfurization scrubbers was conducted in a pilot turbulent contacting absorber operated at 2900 ppm inlet sulfur dioxide concentration. The kinetics of limestone dissolution and SO₂ precipitation suggested an advantage for tubular flow design of the scrubber effluent hold tank. Limestone feed stoichiometry was minimized with tubular flow or by the simulation of tubular flow with multiple stirred tanks. A limestone utilization of 95% was obtained under conditions corresponding to operation of flue gas desulfurization scrubbers with high-sulfur eastern coals containing chloride. This compared with the 60-70% utilization of limestone feed normally obtained in SO₂ scrubbers of current design. (Author abstract modified)

58299

APTIC NO. 82026

Borsheim, Lewis A.

AIR CLEANING STRUCTURE. (Assignee not given.) U. S. Pat. 3,907,529. 11p., Sept. 23, 1975. 12 refs. (Appl. Feb. 11, 1974, 14 claims).

A centrifugal type air cleaner designed for the removal of dust particles from intake air fed to internal combustion engines is described. Although the device is specifically designed for automotive applications, it may be adapted for use with any air stream having entrained contaminants. The device consists of a cylindrical housing having a tangential deflection plate which directs air inwardly, setting up a centrifuging action for the separation of dust particles into a radially narrow duct at the inner side of the outer wall of the air cleaner housing. The latter duct exhausts to the atmosphere.

58300

APTIC NO. 83658

Boscak, Vladimir, Ned Ostojic, and Daryl Gruenwald

ODOR PROBLEMS? DON'T JUST HOLD YOUR NOSE. *Water Wastes Eng.*, 12(5):62,64,67,82, May 1975.

The use of chemical absorption in odor abatement is discussed. The most effective and economical way to abate odor is by chemical absorption. The packed scrubber is the most common type of absorber. Gas enters at the bottom, passes through the packed bed which is irrigated with scrubbing liquid, through the mist eliminator, and is exhausted from the unit by a fan located at a clean air side. Packing ensures the thorough interaction between gases and scrubbing liquid required for good mass transfer. A water solution of an oxidizing chemical like potassium permanganate or sodium hypochlorite is usually used as a scrubbing liquid. The results of a pilot test at a waste water reclamation division at Colorado Springs to determine the most economical system for odor abatement are included.

58301

APTIC NO. 82543

Bose, Ranendra K.

AUTOMOBILE ANTI-AIR POLLUTION DEVICE.
(Assignee not given.) U. S. Pat. 3,892,070. 9p., July 1, 1975. 25 refs. (Appl. Feb. 5, 1973, 11 claims).

An apparatus that significantly reduces the amount of incompletely burned fuel that is discharged from the exhaust system of an internal combustion engine to the atmosphere is described. Most previously used processes for separating gases of dissimilar molecular masses generally require complex and expensive equipment, and must be carefully controlled to effect the desired separation. An exhaust gas control and thermal regeneration device having no moving parts was developed. When it is connected to the exhaust or tail pipe, it operates automatically to substantially separate the heavier combustible inert or fully burned components from the lighter combustible or only partially burned components of the exhaust gas. The lighter unburned components are recycled and directed back into the air intake of the engine for further or complete combustion.

58302

APTIC NO. 82079

Bower, Allen M.

VAPOUR RECOVERY SYSTEMS OF LIQUID FUEL STORAGE. (Emco Wheaton Inc., Conneaut, Ohio) U. S. Pat. 3,908,718. 3p., Sept. 30, 1975. 1 ref. (Appl. June 20, 1974, 6 claims).

A device for use in vapor recovery systems of liquid fuel storage is described. The device compels the operator of a tank truck to connect the vapor recovery system of the tank truck to the vapor tube of a fuel storage tank before it is possible for the operator to fill the fuel storage tank with fuel. Many tank truck operators neglect to connect the vapor hose to the vapor recovery system at service stations, and the problem of air pollution during loading of the storage tanks exists. This device overcomes this difficulty.

58303

APTIC NO. 82642

Bowerman, G. W.

EXPERIENCES IN PREVENTING, DETECTING AND VENTING EXPLOSIONS IN FABRIC COLLECTORS.
Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 10p., 1975. 3 refs. (Presented at the Air Pollution Control Association Specialty Conference on the User and Fabric Filtration Equipment, Buffalo, N. Y., Oct. 5-7, 1975.)

Methods for preventing, detecting, and venting explosions in fabric collectors used for dust control are reviewed. A knowledge of the material being handled in terms of ignition sensitivity, explosibility index, and explosive concentration limits is of primary importance in preventing explosions. Combustible dust handling equipment is preferably located outdoors, and extensive systems are subdivided with the most important components being located in detached or isolated areas. A spark producing scourge of any hazardous milling industry can be controlled with the judicious use of magnets. Effective grounding of dust collector bags is also important. Control bearing temperatures should be monitored with audible

alarms for predetermined high temperatures. Housekeeping and maintenance is the simplest and least emphasized means of preventing explosions. The destructive energy of explosions that do occur in fabric filters can be dissipated either by actual suppression or by pure relief of the explosive forces with auxiliary manual or automatic fire control. Suppression designs utilize highly engineered detectors strategically placed to release a variety of extinguishing agents. An open and unobstructed vent is the most effective means of explosion relief.

58304

APTIC NO. 76089

Bradway, Robert M. and Reed W. Cass

FRACTIONAL EFFICIENCY OF A UTILITY BOILER BAGHOUSE. NUCLA GENERATING PLANT (FINAL REPORT). GCA Corp., Bedford, Mass., GCA/Technology Div., Environmental Protection Agency Contract 68-02-1438, Program Element 1AB012, ROAP 21ADM-032, Task 3, Rept. EPA-600/2-75-013-a, GCA-TR-75-17-G(s), 148p., Aug. 1975. 1 ref.

NTIS: PB 246641/AS

Field evaluations of the fractional efficiency of a fabric filter baghouse operating on a small coal-fired utility boiler were performed using Method 5 techniques and instack impactors. The mean collection efficiency of the baghouse was 99.84%, resulting in a mean outlet loading of 0.0031 grains/dry standard cu ft. The median fractional efficiency of the baghouse over the particle size range of 1-10 micron ranged from 99.4-99.8% and was generally highest for the larger particles. A collection efficiency of 99.5% was measured for particles in the 2-6 micron range, while a collection efficiency 99.7-99.8% was recorded for particles in the 8-10 micron size range. The collection efficiency for 1 micron particles was about 99.4%. Abnormal operating conditions did not result in statistically significant changes in particulate penetration. Frequent bag failures were experienced because of poor flow distribution at the inlet to the bags. (Author conclusions modified)

58305

APTIC NO. 82386

Braeutigam, Hans, Guenter Weidenbach, and Karl Hermann Koepf

CATALYST FOR PURIFYING EXHAUST GASES. (Kali-Chemie Aktiengesellschaft, Hannover (West Germany)) U. S. Pat. 3,891,575. 10p., June 24, 1975. 5 refs. (Appl. Jan. 25, 1974, 28 claims).

A process for the preparation of a highly heat resistant, thermal shock resistant, and break resistant catalyst suitable for the purification of automobile and industrial exhaust gases is described. The process involves coating a non-rusting, scale-free, heat resistant metal skeleton with a layer of aluminum silicate prior to the application of the catalytically active carrier material. The metallic skeleton is preferably made from an alloy steel but may also comprise a normal carbon steel having an enamel coating which is heat resistant up to a temperature of about 1000 C. Preferred catalytically active carrier materials with which the primed metallic skeleton is coated consists of aluminum oxide and magnesium oxide. The metallic skeleton may be formed from a band or wire which is rolled up, corrugated, or balled up to provide sufficient surface area per unit volume. (Author summary modified)

58306

APTIC NO. 83630

Brand, H. D.

PURIFICATION OF ODOROUS EFFLUENT GASES BY OXIDATION USING SODIUM CHLORITE. (Reinigung geruchsbelastigender Abluftstroeme durch Oxidation unter Verwendung von Natriumchlorit). Text in German. Fette Seifen Anstrichm., 77(9):354-357, Sept. 1975.

A method for the deodorization of malodorous waste gases containing hydrogen sulfide, organosulfur compounds and other substances with repulsive odor in oil and fat processing by chemical oxidation is described. Chemical oxidation is done with sodium chlorite solution in water acidified to pH 1-3 with

hydrochloric acid. The washing liquid is used in closed cycle in a packed column, with the waste gas flowing in the opposite direction. At a capacity of 20,000 N cu m/hr, the overall hourly operating costs amount to \$.15/1000 N cu m, i.e., they are substantially lower than the costs of other deodorization processes.

58307

APTIC NO. 80465

Brandstetter, W. R. and G. Decker

FUNDAMENTAL STUDIES ON THE VOLKSWAGEN STRATIFIED CHARGE COMBUSTION PROCESS.

Combustion Flame, 25(1):15-23, Aug. 1975. 10 refs.

The potential of the Volkswagen stratified charge combustion process in reducing exhaust emissions was investigated. The divided combustion chamber, consisting of a main chamber and a prechamber, is preferable for reducing nitrogen oxides. Greater control of mixture stratification has been achieved over a wide engine speed range. Thermal oxidation in the exhaust system is very effective for reducing hydrocarbon emissions. A significant reduction of emissions with a minimum of power loss is obtained by accurate control of the fuel quantities supplied to the main and prechamber. While combustion stability at very lean operation is guaranteed, intake air throttling in the part load range is necessary to keep combustion temperature high enough for effective oxidation of carbon monoxide and hydrocarbons. For good mixture preparation, a modest swirl in the precombustion chamber is advantageous, although too high a swirl results in an unacceptable combustion pressure gradient. The spark plug must be located further down the flow line than the injector to facilitate ignition of the mixture in a broader engine speed range. The injection timing can be kept constant over the entire operating range of the engine. (Author abstract modified)

58308

APTIC NO. 82384

Bratzler, Karl, Alexander Doerges, and Johann Schlauer

PROCESS FOR THE REMOVAL OF HYDROGEN SULFIDE FROM A GAS STREAM. (Metallgesellschaft Aktiengesellschaft, Frankfurt am Main (West Germany)) U. S. Pat. 3,896,215. 6p., July 22, 1975. 6 refs. (Appl. Oct. 19, 1973, 11 claims).

A more efficient and economical method of removing hydrogen sulfide from a gas stream or for transforming hydrogen sulfide to elemental sulfur via the Claus process is described. The gas stream is passed through a Claus process reactor having at least one contact stage, resulting in the transformation of much of the hydrogen sulfide to elemental sulfur. The effluent gas which contains residual sulfur and hydrogen sulfide is afterburned in the presence of a coke layer with a quantity of oxygen sufficient to react stoichiometrically with the sulfur and hydrogen sulfide. The resulting sulfur dioxide is scrubbed from the gas in an absorber. The sulfur dioxide is then desorbed with steam and is recycled to the first contact stage of the Claus process. (Author abstract modified)

58309

APTIC NO. 84311

Braun, B. O.

AUTOMATIC CONTROL TO IMPROVE COMBUSTION IN REFUSE INCINERATORS. Stuttgart Univ., Federal Republic of Germany, Cöners. Refuse Energy Int. Conf. Tech. Exhib., Montreux, Switzerland, 1975, p. 446-451. 3 refs. (Nov. 3-5.)

The design of an automatic control system to improve combustion in refuse incinerators is discussed. The heat output is controlled and kept constant by using flue gas temperature as an auxiliary control variable. Oxygen content in the flue gas pictures the quality of the combustion process and flue gas temperature and O₂ content are the main control variables. The O₂ content in the flue gas of the incinerator with a cylindrical grate is kept constant by a cascade control system changing the air flow through the two main combustion cylinders at constant air pressure. A TV pyrometer is a useful

device for adjusting the secondary air flow of the refuse furnace.

58310

APTIC NO. 82374

Bray, Ulrie B.

GASOLINE ENGINE FUEL. (Bray Oil Co., Los Angeles, Calif.) U. S. Pat. 3,898,055. 2p., Aug. 5, 1975. 7 refs. (Appl. June 7, 1971, 2 claims).

A gasoline additive that reduces the erosion of cast iron exhaust valve seats of internal combustion engines operating on lead-free gasoline is described. The additive consists of an overbased, oil-soluble sulfonate of a Group II metal. The additive results in the formation of a protective deposit of the Group II metal on the engine's valve seats. (Author abstract modified)

58311

APTIC NO. 84460

Brodsky, Y.

FLUE GAS DESULPHURIZATION REGENERATION PROCESSES. Preprint, Economic Commission for Europe, 11p., 1975. (Presented at the Desulphurization of Fuels and Combustion Gases Seminar, 2nd, Washington, D. C., Nov. 11-20, 1975.)

A total of 10 regeneration methods for power plant flue gas purification are described. Five are dry methods: three carbon sorbent processes, and a method for sintering plant gas control; a copper on alumina; and a catalytic oxidation. Fourteen are wet methods: two magnesia processes from which one uses an additive of manganese oxides; four ammonia processes; and seven sodium processes (three of these use sodium salts of citric acid); and a potassium carbonate processes. The technology and economics of the processes are included.

58312

APTIC NO. 82986

Brooks, John Hawley and John Louis Zimmerer

EXHAUST METHOD AND APPARATUS FOR A DUAL CYLINDER TWO-CYCLE ENGINE. (McCulloch Corp., Los Angeles, Calif.) U. S. Pat. 3,875,744. 7p., April 8, 1975. 3 refs. (Appl. Dec. 18, 1972, 2 claims).

An exhaust system for a dual cylinder two-cycle engine is described. It has at least an exhaust port within each chamber. The exhaust system includes a two frustoconical cones which reflect primary positive pressure waves back to the exhaust ports in each of the dual cylinders to minimize the loss of combustible fluid through the exhaust port during scavenging of each of the working chambers. At least one positive pressure wave is reflected from the exhaust port in each of the dual cylinders to reinforce the primary positive pressure waves of another cylinder and thus further minimize fuel loss through the exhaust port during a scavenging process. This device is highly compact and efficient in design in comparison to other devices. (Author abstract modified)

58313

APTIC NO. 83783

Brose, W.

POWER AND HEAT COUPLING IN THE INDUSTRIAL SECTOR. (Kraft-Waerme-Kopplung im industriellen Bereich). Text in German. Energie (Munich), 27(11):308-309, 1975.

Power and heat coupling at power plants for waste heat utilization by nearby industrial plants is of major economic and environmental importance as it would help reduce the thermal loss of power plants from about 60% to 30%. However, the establishment of such distribution systems has major obstacles, mainly due to the fact that many of the prospective consumers have had their power-heat coupling systems for decades, and are concerned about possible problems in connection with the reliability of heat supply, price increases, and breaches of contract.

Bruns, Paul-Heinz, Hermann Kirschke, and Friedrich-W. Moellenkamp

THE SUPPLY OF THE FEDERAL REPUBLIC OF GERMANY WITH REMOTE HEAT BY MEANS OF A NATION-WIDE SUPPLY SYSTEM. (*Die Versorgung der Bundesrepublik mit Fernwärme ueber eine Bandesschiene*). Text in German. *Energie* (Munich), 27(1):4-9, 1975. 3 refs.

The concept of a proposed nationwide remote heat supply system for West Germany is described. The nationwide network to provide low-temperature thermal energy for households, institutions, and even for certain industries, would be operated by thermal and nuclear power plants via water storage facilities for an even heat flow, and would incorporate regional heating power plants. The nodal points of the nationwide network would be the Mannheim, Bonn, Overhausen, Berlin, and Ruhr areas. The nationwide network would imply considerable savings in terms of primary energy, especially in oil and natural gas, and make fuel transportation especially in urban areas unnecessary, which would result in a considerable decrease in combustion- and traffic generated emissions, while the increase in the particulate emissions due to an increased use of coal would not lead to dust concentrations exceeding the existing standards.

Bryan, Robert J. and Robert Norton

COST DATA - VAPOR RECOVERY SYSTEMS AT SERVICE STATIONS. *Pacific Environmental Services, Inc., Santa Monica, Calif., Office of Air and Waste Management Contract 68-02-1405, Task 2, Rept. EPA-450/3-75-085, 20p., Sept. 1975. 6 refs.*

NTIS: PB 248353/AS

Data on the costs of installing vapor control systems at gasoline service stations are presented based on information obtained on a voluntary basis from contractors, purchasers of systems, governmental agencies, and an engineering design firm. The control systems are divided into two types: vapor balance systems and vacuum assist systems with vapor processing units. A further breakdown is given by number of dispensing nozzles. The costs of vacuum assist systems are generally about twice those for vapor balance systems. (Author abstract modified)

Byrers, Richard W.

VAPOR GENERATING SYSTEM AND METHOD. (Foster Wheeler Corp., Livingston, N. J.) U. S. Pat. 3,884,193. Sp., May 20, 1975. 5 refs. (Appl. March 22, 1974, 12 claims).

A vapor generating system and method is described in which a relatively low-grade fuel is burned in a secondary fluidized bed to heat a heat exchange medium which is then routed to a primary boiler for further processing. This system overcomes the problems in conventional boilers in which there is insufficient residence time to complete combustion of fine particles that become entrained in the flue gas. This results in an emissions problem and loss in boiler efficiency. In this system, the fluidized bed refuse fired boiler is connected in a power plant and is compatible with that of the primary boiler utilized in the power plant. The boiler burns unspent combustibles collected from the flue gas emitted from the primary boiler at relatively low temperatures and relatively low gas velocities. (Author summary modified)

Budde, H. J.

ELECTRIC STREET TRAFFIC AND ITS POSSIBILITIES FOR SAVING AND SUBSTITUTING SCARCE FOSSIL HYDROCARBONS. (*Elektrischer Strassenverkehr und*

sein moeglicher Beitrag zur Einsparung und Substitution knapper fossiler Kohlenwasserstoffe). Text in German. *VDI* (Ver. Deut. Ingr.) *Ber.*, (250):59-68, 1975. 19 refs.

Electrically powered vehicles and the outlook for replacing fossil hydrocarbons (specifically crude oil) by coal and/or nuclear energy were discussed. Electricity would be the first form of energy to be converted from fossil to nuclear energy and has already been demonstrated as having the highest energetic efficiency among all alternate fuels in relation to the primary energy used. In the long run, conversion from combustion engines to electric propulsion appears to be the best solution and has already been realized for traffic in densely populated areas, especially if the electric automobile is provided with opportunities for recharging. Experimental cars are being developed by techniques primarily well-known (electronic control, electric motors, lead-storage batteries, and conventional automobile technique) combined with each other and for this purpose for the first time. At today's level of technological development, battery-powered propulsion was only suitable for urban vehicles, first in short-distance traffic for bus lines, later on perhaps for taxis, second cars, heavy trucks and pickup trucks for short-distance hauling of goods.

Budyak, V. F.

THE USE OF 482-CU CATALYST FOR THE REMOVAL OF ORGANIC SULFUR COMPOUNDS FROM HYDROGENATED GAS. (*Primenenie katalizatora 482-Cu dlya ochistki gaza gidrirovaniya ot seroorganicheskikh soedineniy*). Text in Russian. *Neftepererab. Neftekhim.*, vol. 7:25-26, 1975.

Catalyst model 482-Cu has replaced model 481-Cu for the conversion of sulfur-organic compounds contained in rich hydrocarbon gases. Catalyst 482-Cu contains 2-2.5 times fewer noxious mixtures and is more active and more resistant to unsaturated hydrocarbons. Its operating time is twice that of 481-Cu.

Bultez, A. and A. Brandel

CONTROLLING GASEOUS ACID POLLUTION IN THE NEIGHBORHOOD OF THERMAL POWER PLANTS OF ELECTRICITE DE FRANCE. (*Contrôle de la pollution gazeuse acide au voisinage des centrales thermiques d'Electricite de France*). Text in French. *Tech. Moderne*, 67(9):34-37, Sept. 1975.

To reduce sulfur dioxide emissions from fuel oil no. 2, gases are ejected from chimneys at the highest possible altitude. The extent of dispersion depends on the height of the chimney, the emission rate, the speed and temperature of the gases when they come out of the chimney, the speed of the wind, the vertical temperature gradient of the atmosphere, and local atmospheric turbulence. Monitoring networks are designed to detect increases in pollution at ground level; they consist of numerous continuous SF type monitors which record average SO₂ concentrations every 15 min, and direction and speed anemometers to measure wind just above the source of emission (or complete meteorological stations, in cases of major polluters). Air analysis consists of mixing the sample into an oxygenated water solution which retains the acid gases in the form of sulfuric acid. When the acidity in the air exceeds the established safety threshold, the SO₂ emissions are reduced either by using another combustible (a low-sulfur content fuel-oil or low sulfur content coal in cases of a mixed-combustion installation), or by reducing the input to reestablish equilibrium. In either case, emissions are reduced within 30 mn. The Electricite de France network uses 25 automatic analyzers over a 400 sq km area.

58320

APTIC NO. 82893

Bunda, Tsuchio, Itaru Niimi, Yasuhisa Kaneko, and Fumiyooshi Noda

EXHAUST GAS PURIFYING DEVICE FOR AN INTERNAL COMBUSTION ENGINE. (Toyota Jidosha Kogyo Kabushiki Kaisha, Toyota (Japan)) U. S. Pat. 3,881,316. 4p., May 6, 1975. 6 refs. (Appl. May 14, 1973, 8 claims).

An exhaust gas purifying device for an internal combustion engine is described. It consists of a converter body connected to an exhaust passage, and a major diameter cylindrical member and a minor diameter cylindrical member made of an air permeable material and concentrically arranged in the converter body. The device includes ducts for directly monitoring exhaust gases into a bore of the minor diameter cylindrical member or from an exhaust manifold, and a catalyst packed in the two cylindrical members for effecting exhaust gas purification. Unlike conventional systems, this system permits effective use of the catalyst inhibiting activity at elevated temperatures to purify the gases without lowering the output power of the engine. (Author abstract modified)

58321

APTIC NO. 82857

Bundy, Richard P., Larry D. McConnell, and Stanley A. Reigel

APPARATUS FOR SEPARATING PARTICULATE MATTER FROM A GAS STREAM. (Standard Havens, Inc., Kansas City, Mo.) U. S. Pat. 3,876,402. 8p., April 8, 1975. 5 refs. (Appl. Jan. 10, 1974, 1 claim).

A reverse pulse baghouse is described which is equipped with a self-contained service chamber having ventilation control. Ambient cooling is induced by the exhaust fan of the baghouse. Within the dirty air plenum, the bags are of progressively greater length toward the center of the baghouse in order to minimize particle re-entrainment and each bag is sealed against an integral collar of the tube sheet to prevent gas leakage. This cover overcomes the difficulties common in conventional baghouses. The hopper section, for funneling dust cake to a hinged screw conveyor trough, is removably connected to the upper section of the baghouse and is so sized to invertably nest within the upper section during shipment. (Author abstract modified)

58322

APTIC NO. 82891

Bundy, Richard P., Larry D. McConnell, and Stanley A. Reigel

APPARATUS FOR SEPARATING PARTICULATE MATTER FROM A GAS STREAM. (Assignee not given.) U. S. Pat. 3,877,899. 9p., April 15, 1975. 8 refs. (Appl. Sept. 28, 1972, 4 claims).

A reverse pulse baghouse is described which is equipped with a self-contained service chamber having ventilation control in which ambient cooling is induced by the exhaust fan of the baghouse. Within the dirty air plenum, the bags are of progressively greater length toward the center of the baghouse in order to minimize particle re-entrainment. Each bag is sealed against an integral collar of the tube sheet to prevent the gas leakage which is common in other baghouses. The hopper section, for funneling dust cake to a hinged screw conveyor trough, is removably connected to the upper section of the baghouse and is so sized to invertably nest within the upper section during shipment. (Author abstract modified)

58323

APTIC NO. 80920

Bunya, Kinji, Narimitsu Komyoji, and Mitsuo Hida

ESTABLISHMENT OF ELECTROSTATIC PRECIPITATOR FOR THE BATCH COMBUSTION TYPE INCINERATOR. (Bachi nensho-shiki shokuyakuro e no denki shujinsochi no sechi ni tsuite). Text in Japanese. Seikatsu to Kankyo (Life Environ.), 20(10):30-35, Oct. 1975.

An electrostatic precipitator installed at the Shiki Area Waste Incineration Plant in Saitama Prefecture in March 1975 is

described. The addition of the device to the existing batch type incinerator of the Shiki Plant was done to improve the environment for the area residents. Contrary to the conventional belief that no high-efficiency dust collector will be effective for a batch type incinerator, there have been good operational results. The electrostatic precipitator has a capacity of 120 t/8 hr for treating dust and soot discharged from one unit of a batch type waste incinerator of 40 t/8 hr and 4 units of a semi-mechanical incinerator of 20 t/8 hr. The summary of the plan and the results of the operation are discussed.

58324

APTIC NO. 82798

Burchard, John K.

SIGNIFICANCE OF PARTICULATE EMISSIONS. J. Air Pollution Control Assoc., 25(2):99-100, Feb. 1975. 3 refs.

Fine particulate emissions (liquid and solid particles less than 3 micron in diameter) are discussed in terms of their effects on human health and methods for their control. Fine particulates exert their principal effect on health through inhalation and direct attack on the respiratory system which may be manifested by short term irritant effects or longer term damage in the form of emphysema, bronchitis, and pneumoconiosis. High efficiency electrostatic precipitators are capable of removing particles with diameters down to 0.1 micron with an efficiency as high as 98%. However, the range of applicability of conventional precipitators is limited to a fairly narrow range of particle resistivity. Hot-side precipitators appear to offer greater promise for the control of fine particulates.

58325

APTIC NO. 83269

Burger, Hans and Hans Riester

GAS FILTER. (George Fischer Aktiengesellschaft (Switzerland)) U. S. Pat. 3,891,418. 8p., June 24, 1975. 8 refs. (Appl. Dec. 6, 1973, 20 claims).

A gas filter for removing dust and other particulates from a gas stream is described. A filter element is connected at one end to an axially extending outlet sleeve and a guide sleeve is positioned coaxial with and radially inwardly from the outlet sleeve. A flushing gas nozzle is positioned to introduce gas into the outlet sleeve for flow into the filter element. The smallest transverse cross sectional area of the outlet sleeve is at least equal to the cross sectional area of the filter element at the location of the connection of the filter element and outlet sleeve. Equally spaced holes are formed in the guide sleeve in its diverging section from the filter element to afford communication between the interior of the guide sleeve and the space between the guide sleeve and the outlet sleeves. In other filters, the height of the sleeve must be made sufficiently great, related to the filter surface with a given size of filter housing, and such height has an adverse effect on the useful filter area. (Author abstract modified)

58326

APTIC NO. 76067

Burklin, C. E., E. C. Cavanaugh, J. C. Dickerman, and S. R. Fernandes

A STUDY OF VAPOR CONTROL METHODS FOR GASOLINE MARKETING OPERATIONS: VOLUME I - INDUSTRY SURVEY AND CONTROL TECHNIQUES (FINAL REPORT). Radian Corp., Austin, Tex., Office of Air and Waste Management Contract 68-02-1319, Rept. EPA-450/3-75-046-a, 214p., April 1975. 198 refs.

NTIS: PB 246088/AS

Information relating to hydrocarbon emissions from gasoline marketing facilities and to methods for controlling these emissions is presented. Vapor control techniques for tank truck filling, service station tank filling, and vehicle refueling are identified and evaluated. At service stations, 90% control of emissions resulting from underground tank failure operations can be achieved using known technology which essentially involves a balance system with a submerged fill for fuel drops. For Stage II controls, 80% control can be achieved with a

balance system, assuming a reasonably good nozzle-fill pipe interface. A 90% control appears possible if vacuum assist with reasonably good fit is used. Control technology used in either bulk terminals or service stations appears to be directly applicable to bulk stations. The actual impact of gasoline vapor emissions nationwide is not yet quantified. The costs to install recovery systems at new service stations are estimated to be \$3000 for balance systems and \$10,000 for vacuum assist systems, both based on installation at a typical 32,000 gallon/mo station. The costs for an existing station are estimated to be \$6000 for balance systems and \$13,000 for vacuum assist systems. (Author conclusions modified)

58327

APTIC NO. 76083

Burklin, C. E., E. C. Cavanaugh, J. C. Dickerman, and S. R. Fernandes

A STUDY OF VAPOR CONTROL METHODS FOR GASOLINE MARKETING OPERATIONS. VOLUME II - APPENDIX (FINAL REPORT). Radian Corp., Austin, Tex., Office of Air and Waste Management Contract 68-02-1319, Rept. EPA-450/3-75-046-b, 262p., April 1975. 10 refs.

NTIS: PB 246358/AS

Documentation for a study of vapor control methods in the gasoline marketing industry is presented. The data presented refer to hydrocarbon vapor losses from tank truck filling at bulk terminals, service station storage tank filling, and vehicle refueling. The following types of support information are included: industry contacts, trip reports, test reports, referenced support information, and hydrocarbon emission factors for gasoline marketing facilities. Terminology used throughout the study is also defined.

58328

APTIC NO. 82222

Burton, Robert S., III and Gordon B. French

OIL SHALE RETORT FLUE GAS COOLING AND CLEANING. (Occidental Petroleum Corp., Los Angeles, Calif.) U. S. Pat. 3,915,498. 4p., Oct. 28, 1975. 5 refs. (Appl. Sept. 11, 1974 6 claims).

A technique is provided for cooling and cleaning the flue gas or off gas from the bottom of an in situ oil shale retort. The gas is collected in a conduit that has a vertical portion through which the gas flows upward. It is then withdrawn from the retort through a gas tight bulkhead. Water is sparged downwardly through the vertical portion of the conduit for cooling and cleaning the gas. Means are provided for draining the sparged water into a sump at the bottom of the retort in which oil and water are collected. Water and oil are separated and the water may be recycled for additional cooling. (Author abstract modified)

58329

APTIC NO. 76406

Butryn, Gary L. and Karl C. Ayers

MEAD EXPERIENCE IN STEAM STRIPPING KRAFT MILL CONDENSATES. TAPPI, 58(10):78-80, Oct. 1975. 3 refs. (Presented at the Technical Association of the Pulp and Paper Industry Environmental Conference, Denver, Colo., May 14-16, 1975.)

The operation of a full scale steam stripping column in a kraft mill is discussed, including operating problems. The steam stripping column fractionally distills odors and biochemical oxygen demand from many of the dirty condensates produced in the kraft process. The odorous gases pass through a noncontact condenser and are routed through a small heat-traced stainless steel pipe to the lime kiln or standby incinerator for combustion. Mechanical flame arrestors are installed on the gas line immediately ahead of the combustion points. The operating problems include: fiber removal, adequate pumping, foul oil removal and handling, and optimization of the control parameters. (Author abstract modified)

AIR POLLUTION ABSTRACTS, JUNE 1976

58330

APTIC NO. 81100

Caceres, S., L. Do, N. Gonzalez, H. A. Khan, G. K. Mathur, and J. J. O'Donnell

EVALUATION OF R AND D INVESTMENT ALTERNATIVES FOR SOX AIR POLLUTION CONTROL PROCESSES, PART 2 (FINAL REPORT). Kellogg (M. W.), Co., Houston, Tex., Environmental Protection Agency Contract 68-02-1308, Program Element 1AB013, ROAP 21ADE-010, Task 23, Rept. EPA-650/2-74-098-a, 267p., Aug. 1975. 26 refs.

A cost analysis of alternative sulfur oxide control processes for utility plants, industrial boilers, and sulfuric acid plants is presented. Control technologies evaluated include: wet limestone and Wellman Lord/Allied Chemical processes, coal gasification, and solvent refining. Little difference appears to exist between the scrubbing costs of wet limestone and Wellman Lord/Allied Chemical systems for existing utility plants. Capital costs average from about \$200/KW for plants of 40 MW size to about \$40 KW for 3000-megawatt plants. Operating costs for these plant sizes range from 10 mills/KWH for the smaller plant to 2 mills/KWH for the large plant. Capital costs for scrubbing systems at existing industrial boiler plants range from about \$0.8/MM Btu/yr for plants of 10,000 MM Btu/hr to \$2.4/MM Btu/yr for plants of 100 MM Btu/hr capacity. Operating costs average from \$0.2/MM Btu for plants of 3000 MM Btu/hr capacity to \$1.8/MM Btu for plants having capacities of 100 MM Btu/hr. Tail gas scrubbing capital costs for existing sulfuric acid plants range from \$58/ton of annual acid capacity for plant capacities of 10 M tons/yr to about \$10/ton for plants with capacities of 1800 M tons/yr. The corresponding operating costs are \$17/ton of acid for the smaller plant and \$4/ton of acid for the larger plant. The cost of substitute natural gas is estimated to vary from a low of \$1.14/MM Btu to a high of \$2.67/MM Btu. Intermediate Btu gas production costs vary from \$1.17-1.65/MM Btu, depending on coal costs, coal analysis, and plant location. Production costs for low Btu gas vary from \$1.00-1.45/MM Btu. Costs for solvent refined coal are about 55-60% of the cost for substitute natural gas. (Author summary modified)

58331

APTIC NO. 82155

Caldwell, Roland B.

CONTROL SYSTEM FOR EXHAUST GAS RECIRCULATING VALVE. (Ranco Inc., Columbus, Ohio) U. S. Pat. 3,915,136. 13p., Oct. 28, 1975. 6 refs. (Appl. Sept. 9, 1974, 16 claims).

An exhaust gas recirculation valve for the control of nitrogen oxide emissions from internal combustion engines is described which remains closed irrespective of the gas flow rate through the engine when the latter idles or operates at wide open throttle. The recirculation control valve is operated by pressure from the intake manifold and is controlled by a pressure regulator. The regulator responds to a pressure signal which varies as a function of the air intake flow rate into the engine. When the throttle is closed or at idle position, a controller responsive to the air pressure at a spark port adjacent the throttle plate prevents the regulator from opening the exhaust gas recirculation control valve. The controller also prevents the regulator from opening the exhaust gas recirculation valve when the engine approaches a wide open throttle condition. (Author abstract modified)

58332

APTIC NO. 83608

Caldwell, Roland B.

EXHAUST GAS RECIRCULATION CONTROL SYSTEM FOR INTERNAL COMBUSTION ENGINES. (Ranco Inc., Columbus, Ohio) U. S. Pat. 3,884,200. 10p., May 20, 1975. 10 refs. (Appl. Aug. 3, 1971, 29 claims).

A vacuum operated valve for controlling recirculation of exhaust gases through an internal combustion engine is described. It is actuated by the output of a vacuum regulator having a source vacuum from the intake manifold. It is regu-

lated by the vacuum in the venturi of the carburetor to produce a vacuum output which is an amplification of the venturi vacuum. The amplified output is terminated when the engine choke is operative. A reservoir maintains a vacuum to the vacuum regulator during moderate acceleration and a valve responsive to a minimum vacuum in the intake causes the vacuum regulator to cut off its output and close the recirculation valve during heavy acceleration or loading. This device is inexpensive and practical. (Author abstract modified)

58333

APTIC NO. 76008

Calvert, Seymour and Samuel Stalberg

EVALUATION OF SYSTEMS FOR CONTROL OF EMISSION FROM ROCKET MOTORS - PHASE I (INTERIM REPORT). A.P.T., Inc., San Diego, Calif., Air Force Rocket Propulsion Laboratory and Environmental Protection Agency Interagency Agreement EPA-1AG-R5-0644, Contract 68-02-1328, Task 8, Program Element 1AB012, ROAP 21ADL-010, Rept. EPA-600/2-75-021-a, 57p., Aug. 1975. 5 refs.

NTIS: PB 245590/AS

An engineering evaluation of methods for controlling emissions from solid rocket test firings is presented. The primary emissions requiring control are carbon monoxide, hydrogen chloride, hydrogen fluoride and aluminum oxide particles. A pilot scale scrubber currently in operation on a 22,200 newton (5000 lb) motor is examined and appears to require an excessive amount of water if scaled up for a rocket of larger thrust. Scoops appear to provide one simple means of reducing the quantity of scrubbing water required. Pilot-scale tests to determine the technical feasibility of the idea are recommended. (Author abstract modified)

58334

APTIC NO. 76137

Calvert, Seymour, Shuichow Yung, and James Leung

ENTRAINMENT SEPARATORS FOR SCRUBBERS - FINAL REPORT. A.P.T., Inc., San Diego, Calif., Environmental Protection Agency Contract 68-02-0637, Program Element 1AB013, ROAP 21ACX-086, Rept. EPA-650/2-74-119-b, 223p., Aug. 1975. 45 refs.

Present wet scrubber entrainment separation technology was evaluated, and experimental studies were conducted to develop improved methods for entrainment separation. Presently available entrainment separators appeared to suffer from such shortcomings as overdesign, low operating velocities due to flooding or reentrainment, unpredictable performance due to the lack of reliable industrial operating data, and plugging by solids. Primary collection efficiency of knitted mesh, packed bed, tube bank, and cyclone scrubbers was predicted reasonably well by mathematical models in the literature for low gas velocities, and a theoretical model was developed for zigzag baffles. Areas requiring further study to allow for the accurate design of an entrainment separator include: reentrainment mechanisms and loading for separators under various operating conditions, entrainment loading and drop size distribution from various scrubbers under different operating conditions, solids deposition and factors affecting the deposition rate, and effective separator washing methods and washing liquid flow rates. (Author conclusions modified)

58335

APTIC NO. 76187

Calvert, Seymour, Nikhil C. Jhaveri, and Timothy Huisking

STUDY OF FLUX FORCE/CONDENSATION SCRUBBING OF FINE PARTICLES (FINAL REPORT). A.P.T., Inc., San Diego, Calif., Environmental Protection Agency Contract 68-02-1082, Program Element 1AB012, ROAP 21ADL-005, Rept. EPA-600/2-75-018, 188p., Aug. 1975. 26 refs.

Results of a laboratory pilot scale evaluation of a multiple plate, horizontal spray, flux force/condensation scrubber designed for the removal of fine particulate matter from gas streams are presented. Collection efficiencies of better than

95% for fine particles are achieved with a condensation ratio of about 0.15 g vapor condensed/g dry gas. Particle collection efficiency increases as the amount of vapor condensed per unit of gas scrubbed is increased or as the inlet particle number concentration is decreased. Scrubber performance is not affected by changing the liquid to gas flowrate ratio within the scrubber operative range. The flux force/condensation scrubber is more economical than high energy scrubbers when high fine particle collection efficiencies are required or when the gas to be scrubbed is hot or humid. (Author summary modified)

58336

APTIC NO. 82392

Campolongo, Joseph

VORTEX SEPARATOR. (Pall Corp., Glen Cove, N. Y.) U. S. Pat. 3,895,930. 10p., July 22, 1975. 9 refs. (Appl. May 15, 1973, 10 claims).

A vortex particle separator which prevents abrasion caused by spinning particles is described. The separator consists of an annular contaminant chamber and a baffle at the entrance to the chamber or within the chamber itself. In the absence of scavenge exhaust flow, the baffle inhibits the whirling of particles retained in the annular chamber while not interfering with the entry of such particles into the chamber or their exhaust from the chamber. The baffle may also be designed as a closure to prevent the retained particles which build up within the chamber from being swept out into the clean air stream by the cyclonic flow in the vortex tube.

58337

APTIC NO. 83773

Cant, N. W.

AIR POLLUTION DUE TO MOTOR VEHICLES: PART II: A REVIEW OF THE CHEMISTRY OF CATALYTIC METHODS. Proc. Roy. Australian Chem. Inst., 42(10):311-316, Nov. 1975. 40 refs.

The control of motor vehicle air pollutants in Australia is discussed. The concentrations of carbon monoxide and ozone which periodically prevail in Sydney are far higher than desirable. The chief source of CO is motor vehicle exhaust, while O₃ results from a complicated photochemical reaction involving olefins and nitrogen oxides. It is uncertain whether reductions in emissions of hydrocarbons or of NO_x are the most effective in reducing potential for O₃ formation, but hydrogen control is currently more cost effective. Restrictions on the use of motor vehicles in Sydney during the morning peak hours is the simplest means of reducing potential, but it is not feasible. Current policy is to require that all new vehicles sold in Australia meet regulations which specify maximum permissible emissions. Limits which are effective July 1976 are unlikely to do more than arrest the current upward trend in peak O₃ concentrations in Sydney. The regulations can be met by well established engine modifications with some penalty in operating convenience and fuel economy. Reaction kinetics and mechanisms of catalytic control systems are discussed.

58338

APTIC NO. 76617

Cappelli, P. G., F. Ciaccia, and D. Martorana

THERMAL REACTORS FOR THE CONVERSION OF UNBURNED PRODUCTS IN CAR EXHAUST GAS: A PROBLEM OF MATERIALS. Riv. Combust., 29(5-6):241-254, May-June 1975. 18 refs.

Metallic and ceramic materials for thermal reactors for the conversion of unburned products in car exhaust gas were evaluated. Ferritic chromium aluminum, silicon, titanium 18 SR material has satisfactory properties for the production of an experimental metallic thermal reactor. There is a remarkable surface stability at 1100 C in an oxidizing atmosphere both in the laboratory and simulated service conditions. The mechanical properties both at room and at elevated temperatures are generally poorer than those of the austenitic stainless steels and considerably lower than those of the nickel superalloys. The 18 SR metal is at the acceptability limit for deep drawing,

while its weldability is satisfactory, provided that specific protective measures are taken during welding. (Author conclusions modified)

58339

APTIC NO. 80037

Caradus, W. G.

ELECTRICAL SERVICES AND LIGHTING. *New Zealand Eng.*, 30(8):236-241, Aug. 15, 1975. 5 refs.

Carbon monoxide sensing and control measures in the Terrace Tunnel (Wellington, New Zealand) are described. Carbon monoxide levels are sensed by three analyzing units located at the middle of the tunnel, 60 m from each portal. Each unit has three output levels adjustable over a wide range. Two levels (low and high) initiate fan operation. The third level operates a high CO alarm circuit. For low level operation, nine fans run for a minimum of 20 minutes and then shut down. If CO is still above the low level setting, the remaining nine fans start after the delay period and sensing of the air flow, and run for an additional 20 minutes. This sequence repeats, interchanging successive fan groups until CO reaches a safe level. Meters in the control center continuously monitor the CO content of the air supplied to the three analyzing units. An audible and visible alarm is given if the CO content at any of the analyzers reaches the alarm level.

58340

APTIC NO. 82540

Carcea, Giampaolo

DEVICE FOR REGULATING THE RATE OF FLOW OF THE AIR BLOWN INTO THE EXHAUST DUCT OF AN INTERNAL COMBUSTION ENGINE. (*Alfa Romeo S.p.A., Milan (Italy)*) U. S. Pat. 3,892,071. 7p., July 1, 1975. 3 refs. (Appl. Feb. 5, 1973, 5 claims).

A device for regulating the rate of flow of the air blown into the exhaust duct of an internal combustion engine is described. Unlike the conventional metered air pump, a substantially constant ratio is obtained between the rate of flow of the exhaust gases and the rate of flow of the air injected for postcombustion, at least within a preselected rate of revolution field of the engine. The ratio can be varied, in the sense of reducing the rate of flow of the blown-in air when the engine is driven so as to deliver high power. Postcombustion is either unnecessary or unadvisable. (Author summary modified)

58341

APTIC NO. 83902

Carlsson, Kurt and Stefan Ahman

INDUSTRIAL GAS CLEANING - PART 2. (*Industriell gasrening - del 2*). Text in Swedish. *Kem. Tidskr.*, 87(5):52-54, May 1975.

Industrial separators for particulate matter and gaseous air pollutants are reviewed. Cyclones, suitable for dust separation to a minimal particle size of 1 micron and a minimal density of 1 g/cu m, are used for flue gas cleaning behind roasting furnaces, ore dressing plants, and fertilizer production plants, in a wide temperature range. Tissue filters are used mainly in the ceramic, wood, and food processing and chemical industries. Particle separation on such filters is due to inertia and electrostatic effects, and to Brownian motion. Modern tissue filters are dedusted by means of short air jets. Wet scrubbers are suitable for the separation of both particulate matter and certain gaseous components. Sulfur dioxide emissions from sulfate pulp plants can be abated by means of scrubbers after the soda boiler. An experimental FlaktNatekoGasreactor by AB Svenska Flaktfabriken is suitable for SO₂ separation from power plant flue gases with and without sulfur recovery. Hydrogen fluoride, generated in the aluminum industry, can be adsorbed efficiently on powdered alumina in a special reactor, after which the fluoride-loaded dust is separated by means of a textile filter. Chemical scrubbing is suitable for the abatement of many malodorous emissions.

58342

APTIC NO. 82677

Carson, Don B.

COUNTERCURRENT CATALYTIC CONTACT OF A REACTANT STREAM IN A MULTI-STAGE PROCESS AND THE APPARATUS THEREFOR. (*Universal Oil Products Co., Des Plaines, Ill.*) U. S. Pat. 3,882,015. 8p., May 6, 1975. 3 refs. (Appl. May 29, 1973, 9 claims).

A unitary, multiple-stage reaction system for counter currently contacting a fluid reactant stream with catalyst particles which are movable through the system via gravity flow is described. It is especially adaptable for use in both endothermic and exothermic conversion systems. The reaction chamber provides for the introduction of a heat exchange fluid between stages. There is no other process which provides a countercurrent flow of the reactant stream with a downwardly moving bed of catalyst particles. (Author abstract modified)

58343

APTIC NO. 82173

Carter, Jimmy L., Michael T. Chapman, and Bill G. Yoakam

PROCESS FOR SELECTIVE REDUCTION OF OXIDES OF NITROGEN. (*Gulf Oil Corp., Pittsburgh, Pa.*) U. S. Pat. 3,895,094. 4p., July 15, 1975. 7 refs. (Appl. Jan. 28, 1974, 2 claims).

A process is claimed for selectively reducing oxides of nitrogen to nitrogen in a mixture of gases containing up to 10% oxygen, up to 2% nitric oxide, and up to 2% nitrogen dioxide, and the remainder an inert gas. The mixture of gases is contacted in a reaction zone with an approximately stoichiometric amount of ammonia at a space velocity less than 60,000 and a temperature between 200 C and 300 C in the presence of a catalyst consisting of an acid resistant aluminosilicate molecular sieve composition having a surface area of at least 350 sq m/g and substantially uniform intercrystalline pores with effective diameters of at least 6 Å. The apparatus employed and the operation of the process on a semicommercial scale to remove nitrogen oxides from a tail gas stream in a nitric acid plant are described. (Author abstract modified)

58344

APTIC NO. 82160

Casteline, Peter, Jr.

FUEL VAPOR SEAL DEVICE. (*Cities Service Oil Co., Tulsa, Okla.*) U. S. Pat. 3,911,973. 7p., Oct. 14, 1975. 3 refs. (Appl. Jan. 18, 1974, 13 claims).

A fuel vapor seal device for preventing the escape of gasoline vapors during the filling of motor vehicle fuel tanks is described which must be locked to the fuel tank to render the fuel dispensing apparatus operable. The device consists of a locking-ring assembly with a means for interconnecting with the fill pipe of a fuel tank to prevent the loss of fuel to the atmosphere. The assembly is also provided with a projection having a closure element which opens and closes a vacuum shut-off aperture of the dispensing apparatus when the device is moved relative to the spout. The locking-ring assembly includes a conduit for channeling fuel vapor displaced from the tank to a storage facility as well as a spring for moving and turning the fuel vapor seal and collection device to close the shut-off aperture automatically when the delivery spout is disengaged from the tank fill pipe. (Author abstract modified)

58345

APTIC NO. 76400

Cesario, Frank J.

ENVIRONMENTAL-ENERGY POLICIES AND AUTOMOTIVE POLLUTION. *J. Environ. Syst.*, 5(1):13-28, 1975. 19 refs.

The environmental implications of alternative environmental/energy policies which affect fuel availability and prices are determined. The analysis is performed with reference to five urban regions of New York State. The environmental model provides estimates of the automotive emissions of hydrocarbons, carbon monoxide, and nitrogen oxides in a region under a wide variety of assumptions about the spatial arrangements

of human and economic activity within the region. It is designed to be used in conjunction with other models that supply relevant traffic volume estimates as input and utilize the output for assessing the air quality implications of a given emissions pattern. It is presumed that travel forecasts are available exogenously and that a dispersion model capable of translating emissions quantities into air quality is available. Due to the interdependent nature of environmental and energy conservation objectives, policies in these two areas of concern should be developed jointly. (Author abstract modified)

58346

APTIC NO. 80289

Chamberlain, C. T. and D. F. Cooke

INCINERATOR EMISSIONS AND THEIR CONTROL.

The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 114-133. 15 refs. (Feb. 17-21.)

Emissions generated by waste incinerators are discussed along with methods for their control. Incinerator emissions include unburnt gases such as carbon monoxide and hydrocarbons, inorganic and organic compounds of sulfur and nitrogen, and particulates. Most waste incinerators produce appreciably less nitrogen oxides than conventional fuel combustion processes because the temperature of combustion in an incinerator tends to be much lower. Odors form a class of pollutants frequently associated with malfunctioning or badly designed incinerators. Methods for controlling incinerator emissions include: afterburning and the use of cyclones, electrostatic precipitators, and wet scrubbers. A comparison of emission standards in different countries reveals considerable differences in allowable emission levels.

58347

APTIC NO. 82657

Chambon, Michel G. J. du

AUTOMOTIVE UNIT FOR THE COLLECTION AND INCINERATION OF HOUSEHOLD OR INDUSTRIAL REFUSE. (Locaner, Buthiers (France)) U. S. Pat. 3,882,800. 10p., May 13, 1975. 6 refs. (Appl. Feb. 13, 1974, 14 claims).

An automotive unit for the simultaneous collection and incineration of household or industrial refuse is described. The apparatus provides a particularly efficient solution to environmental pollution and obviates and drawbacks of undesired transportation. The unit consists of a fluid tight incineration assembly formed by a rotary furnace; an outer casing turning jointly with the furnace and forming an ash storage receptacle; a fluid tight device for the introduction of the refuse into the furnace; and a fume discharge sheath connected in a fluid tight manner to one end of the furnace and leading to means for afterburning, cleaning fumes, and combustion gases. (Author abstract modified)

58348

APTIC NO. 82114

Chana, Howard E.

VACUUM SIGNAL CONTROLLER FOR TRANSMISSION CONTROLLED EMISSION DEVICE. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,915,035. 9p., Oct. 28, 1975. 7 refs. (Appl. July 29, 1974, 4 claims).

An exhaust gas recirculation system is described for an internal combustion engine which includes a regulator valve for proportioning exhaust gas recirculation in accordance with engine operating conditions. Other systems do not control recirculation in accordance with the mass flow of air and fuel to the engine under all operating conditions of the exhaust gas recirculation being terminated under wide open throttle conditions. The control valve is positioned by a vacuum operator. A modulated vacuum control signal is directed to the vacuum operator from a converter which produces a modulated vacuum signal proportional to a hydraulic signal from an automatic hydraulic transmission for the vehicle. The signal reflects the intake manifold pressure and the speed of operation of the vehicle so as to accurately reflect the mass flow of air and fuel to the engine.

58349

APTIC NO. 82370

Chandler, Roger E.

GASOLINE CONTAINING ASHLESS DISPERSANT.

(Exxon Research and Engineering Co., Linden, N. J.) U. S. Pat. 3,897,224. 7p., July 29, 1975. 1 ref. (Appl. Dec. 17, 1970, 3 claims).

A gasoline additive for reducing carburetor deposits resulting from positive crankcase fumes and other sources is described. The reduction of such deposits also results in reduced exhaust emissions. The additive consists of an oil-soluble amide dispersant derived from an aliphatic polyamine and a monocarboxylic acid having a molecular weight in the range of 600-3000. An amide prepared from tetraethylene pentamine and polyisobutylene propionic acid is particularly useful.

58350

APTIC NO. 82323

Chapman, Walter H. and John F. Eichelmann, Jr.

AIR AND WATER POLLUTION CONTROL. (El Paso Southern Co., El Paso, Tex.) U. S. Pat. 3,890,207. 7p., June 17, 1975. 13 refs. (Appl. March 20, 1973, 10 claims).

An air and water pollution control process for purifying industrial effluent gases is described. The gases are contacted with water to give a purified gaseous stream, which is evacuated to the atmosphere, and a water effluent containing suspended and dissolved contaminants. The waste gases can include the oxides of sulfur and nitrogen, hydrogen sulfide, carbon monoxide, organic carbon containing compounds, inorganic salts and minerals, and carbon dioxide. The suspended contaminants are separated and the resultant water effluent is freed of dissolved noxious gases and fumes and is substantially distilled to give a pure water condensate and a concentrated effluent containing dissolved solids. The concentrated water effluent is mixed with a recirculating, relatively non-volatile carrier liquid. The water is evaporated and recovered as an industrial water condensate. The precipitated solids are removed from the carrier liquid. Other systems require much larger amounts of water, which needs to be disposed of.

58351

APTIC NO. 81988

Charmes, Andre

CATALYTIC SUPPORTS. (Calinter S.A., Geneva (Switzerland)) U. S. Pat. 3,914,114. 3p., Oct. 21, 1975. 3 refs. (Appl. June 1, 1973, 4 claims).

A catalyst support for use in catalytic afterburners is described which overcomes prior art disadvantages associated with poor mechanical and thermal resistance. The support consists of a mat of metallic fibrous material forming a permeable surface backing and numerous metal filaments mounted in and extending perpendicularly from the backing. The members are preferably made by means of an extruded yarn. The ratio of the perimeter of a member's cross section to the surface of this section ranges between 300 and 500.

58352

APTIC NO. 83524

Charpentier, J. C.

GAS SCRUBBING WITH A SELECTIVE SOLVENT. CONCEPT OF SCRUBBERS. (Le lavage des gaz par un solvant selectif. Conception des laveurs). Text in French. Pollut. Atmos. (Paris), 17(66):109-124, April-June 1975. 19 refs.

The thermodynamics, kinetics, and technico-economics of gas scrubbing with a selective solvent (absorption with or without a chemical reaction of a pollutant solute) are reviewed. These considerations are not sufficient to deduce the length of the scrubber unless the global material transfer, solubility, diffusion, and kinetic coefficients are determined with small scale installations with known contact times. With regard to the determination of the scrubber's diameter, the data presented can only lead to a preliminary estimate; the foaming and axial dispersion problems, among others, require great security margins.

58353

APTIC NO. 76097

Chi, C. T., E. C. Eimutis, W. H. Hedley, M. V. Jones, R. Jones, and L. B. Mote

A METHOD FOR EVALUATING SO₂ ABATEMENT STRATEGIES (FINAL REPORT). Monsanto Research Corp., Dayton, Ohio, Environmental Protection Agency Contract 68-02-1320, Program Element 1AB013, ROAP 21ADE-008, Task II, Rept. EPA-660/2-75-045, MRC-DA-492, 86p., Sept. 1975. 15 refs.

A non-deterministic, probabilistic methodology for evaluating sulfur oxide abatement alternatives is described. The method is not restricted to gas scrubbing models and is capable of handling clean fuel substitution processes also. A Monte Carlo simulation approach is used to treat fully developed cost models and also those which encompass a high level of uncertainty either in structure or process parameters. Impact assessment techniques are presented which develop the methodology of alternative future scenarios. A specific example, the Wellman-Allied Process, is used to demonstrate the utility of this simulation methodology. (Author abstract modified)

58354

APTIC NO. 76310

Chiesa, W.

ELIMINATION OF POLLUTING PARTICLES FROM ROAD TUNNELS. CONTRIBUTION FROM EXPERIMENTS ON MODELS. (*L'eliminazione delle polveri inquinanti dalle gallerie stradali. Contributo di esperienze su modelli*). Text in Italian. Tech. Ital., 40(1-3):13-29, Jan.-March 1975. 15 refs.

Model studies on tunnel pollution and tunnel structure indicate that with transverse ventilation in which clean air is introduced at the top of the gallery and let out at the bottom, it is possible to remove far greater quantities of powder than with the more frequently used scheme, in which the air currents are reversed. Alterations of the geometric configuration of the transverse section of the tunnel that affect the elimination of solid particulate matter are discussed. Improvements obtained by replacing pavements with large, robust grills at road level were significantly superior to those obtained by the sole use of the downward air flow. Thus, for the removal of powders from transversely ventilated tunnels, the best results are with a top inflow of air accompanied by the appropriate modification of the transverse section of the tunnel. Elevated passageways and pavements above the road level should be abolished.

58355

APTIC NO. 82672

Chinnock, Charles R. and James B. Kaminski

METHOD AND APPARATUS FOR HANDLING DUST SEPARATED FROM GASES. (National Steel Corp., Pittsburgh, Pa.) U. S. Pat. 3,879,179. 14p., April 22, 1975. 1 ref. (Appl. Jan. 25, 1974, 49 claims).

A method and apparatus for handling dust separated from gases are described. At present the top gas from metallurgical furnaces is passed into a dust catcher where reducing the velocity of the gas and changing its direction of flow removes about 60-75% of the dust carried over from the furnaces. This separated dry dust collects in the bottom of the dust catcher and is fed to a pug mill in which the dust is moistened slightly to prevent it from blowing around as it is transferred in to a vehicle for removal. This is a dusty operation with danger of leakage of the highly combustible top gas into the atmosphere. The dust is reduced by forming a slurry in water in a separate mixing and holding tank located below the dust catcher. The dust is readily and safely landed in the form of a water slurry without pollution of the atmosphere. At the same time the recovered dust is placed in a form which can be handled by a conventional thickener and filter system.

58356

APTIC NO. 76136

Choi, P. S. K., E. L. Kropp, W. E. Ballantyne, M. Y. Anastas, A. A. Putnam, D. W. Hissong, and T. J. Thomas

SO₂ REDUCTION IN NON-UTILITY COMBUSTION SOURCES - TECHNICAL AND ECONOMIC COMPARISON OF ALTERNATIVES (FINAL REPORT). Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract 68-02-1323, Program Element 1AB013, ROAP 21ACX-083, Task 13, Rept. EPA-600/2-75-073, 316p., Oct. 1975. 105 refs.

A technical and economic comparison of alternative methods for controlling sulfur dioxide emissions from non-utility combustion sources of various size classes and fuel types is presented. Control alternatives considered include: physical coal cleaning, coal gasification, coal liquefaction, fluidized bed combustion of coal, and flue gas desulfurization. The last alternative is economically favored over other alternatives for non-utility combustion sources in large size classes. All flue gas desulfurization processes are technically feasible for application to non-utility combustion sources. The use of processed fuels is economically favored over other alternatives for small non-utility combustion sources. (Author summary modified)

58357

APTIC NO. 81598

Christman, Robert D., Alfred M. Henke, John A. Paraskos, Geoffrey R. Wilson, and Stephen J. Yanik

PLURAL STAGE RESIDUE HYDRODESULFURIZATION PROCESS. (Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat. 3,905,893. 29p., Sept. 16, 1975. 12 refs. (Appl. Aug. 22, 1973, 6 claims).

A multiple stage process for the catalytic hydrodesulfurization and hydrodemetallization of a residual petroleum oil boiling above the gasoline range is described. The product of the process consists essentially of material boiling above the gasoline range and material boiling below the initial boiling point of the residual oil feed. The hydrodesulfurization-demetalization process consists of an initial stage involving relatively high hydrogen pressure in the presence of a catalyst comprising a relatively low proportion of catalytically active hydrogenation metals. The process employs a final stage in series having a relatively lower hydrogen pressure and a catalyst comprising a relatively higher proportion of hydrogenation metals. This is in direct contrast with other multistage hydrodesulfurization processes. The stream entering the final stage contains an amount up to 10, 20, or 25 wt% of the asphaltene content of the charge to the first stage while the effluent from the final stage is essentially free of asphaltenes. (Author abstract modified)

58358

APTIC NO. 82609

Cilione, P. F.

TESTING AND ACCEPTANCE REGULATIONS FOR FABRIC FILTRATION - THE ENGINEERS VIEWPOINT. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 8p., 1975. 6 refs. (Presented at the Air Pollution Control Association Specialty Conference on the User and Fabric Filtration Equipment, Buffalo, N. Y., Oct. 5-7, 1975.)

An alternative to the Environmental Protection Agency Method 5 for testing the effectiveness of a fabric filter designed for particulate control is described. The alternate method involves first estimating the emission weight rate from the design data utilizing the dust particle size distribution and the fabric filter performance curves and secondly approximating the emission concentration from opacity observations. The accuracy of the method can be tested by a relative comparison with the magnitude of the emissions. A shortcoming of the method is the reliability of opacity.

58359

APTIC NO. 82982

Clarke, Ralph H., Wesley James Clarke, and L. Mays

INDUSTRIAL AIR FILTER. (Clarke & Sheet Metal, Inc., Eugene, Oreg.) U. S. Pat. 3,871,845. 7p., March 18, 1975. 4 refs. (Appl. June 25, 1973, 13 claims).

An industrial air filter capable of meeting stringent air pollution controls is described. The filter structure has a central air inlet which discharges downwardly into a circular enclosure with ports through which the air is laterally diverted. Plenums associated with the ports discharge dust laden air upwardly into filter bag ends for flow therealong and ultimately through the bag wall depositing particles thereon. A purge assembly sequentially blocks the entry of dust laden air into the ports and hence the filter bags while simultaneously applying a negative pressure to the bag interior for purging of same. The purge assembly includes means for removing deposited dust particles from a floor surface of the enclosure. Conventional air filters are costly in both price and maintenance and require periodical servicing for removal of dirt from collection areas. (Author abstract modified)

58360

APTIC NO. 82167

Clawson, Lawrence G.

CHARGE FORMING DEVICE WITH FUEL VAPORIZATION. (Thermo Electron Corp., Waltham, Mass.) U. S. Pat. 3,894,520. 8p., July 15, 1975. 8 refs. (Appl. March 13, 1974, 8 claims).

An internal combustion engine is adapted to permit combustion of heavy liquid hydrocarbon fuels. Exhaust gases are mixed with the fuel just before the fuel enters the intake manifold, so that upon entry into the intake manifold and before introduction into the combustion chamber the fuel is entirely vaporized. The invention is especially compatible with an internal combustion engine of the stratified charge type having one or more cylinders, each including a main chamber, a prechamber communicating with the main chamber for igniting a charge in the main chamber, and a fuel supply system for supplying fuel and air to the main chamber as a function of engine load and feeding fuel to the prechamber as an inverse function of engine load. Primary exhaust gases from the main chamber are introduced into an exhaust passage at a temperature varying as an increasing function of engine load. Fuel is introduced in a trickle into a continuously open cross-over tube penetrating a wall separating an intake passage from the exhaust passage. A higher characteristic pressure is maintained in the exhaust passage than in the intake passage, inducing a flow of exhaust gases from the exhaust passage through the crossover tube into the intake passage. The pressure differential varies as an increasing function of engine load. The fuel is vaporized by means of heat transferred from the exhaust gases to the fuel. The fuel exhaust mixture is transported through the cross-over tube into the intake passage by means of the flow of exhaust gases. The mixture is then introduced into the main combustion chamber. The portion of the exhaust gases mixing with the fuel is regulated to control the temperature of the mixture. (Author abstract modified)

58361

APTIC NO. 73491

Collman, John S., Charles A. Amann, Charles C. Matthews, Richard J. Stettler, and Francis J. Verkamp

THE GT-225 - AN ENGINE FOR PASSENGER-CAR GAS-TURBINE RESEARCH. General Motors Corp., Warren, Mich., Research Labs., Rept. GMR-1726, 25p., March 10, 1975. 47 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750167.)

Design considerations and exhaust emission tests simulating the 1975 Federal Test procedure are reported for the General Motors GT-225 gas turbine engine. Vehicle tests of the engine demonstrate hydrocarbon, carbon monoxide, and nitrogen oxide emissions of 0.18 g/mi, 1.2 g/mi, and 0.38 g/mi, respectively. Fuel economy is competitive with that of conventional

passenger cars at turnpike speeds. The engine promises to meet the most stringent 1978 Federal emission standards.

58362

APTIC NO. 82486

Compton, William A., Joseph F. Nachman, and Manfred I. Seegall

SINTERED NOX REDUCTION CATALYSTS. (International Harvester Co., San Diego, Calif.) U. S. Pat. 3,892,836. 5p., July 1, 1975. 4 refs. (Appl. Jan. 7, 1974, 5 claims).

Novel improved catalysts for eliminating nitrogen oxides from exhaust and other gases are described. The catalysts are mixtures of cerium oxide and praseodymium oxides. They are economical and can be chemically regenerated if they become poisoned.

58363

APTIC NO. 76639

Cooper, B. J.

LEAD POISONING OF AUTOMOBILE EMISSION CONTROL CATALYSTS. THE INFLUENCE OF EMISSION SYSTEM DESIGN. *Platinum Metals Rev.*, 19(4):141-145, Oct. 1975. 6 refs. (Presented at the American Chemical Society Symposium on Auto Emission Catalysts, Chicago, Ill., Aug. 1975.)

The influence of emission system design on the lead poisoning of automobile emission control catalysts was investigated. The poisoning is greatly accelerated by exposing the catalyst to a feed containing the equivalent of 1.5 g Pb/U. S. gallon. The poisoning process is accelerated by the presence of halide scavenger. The greater toxicity in the presence of scavenger is reflected by the lower performance, even though the amount of Pb deposited on the catalyst is reduced by the scavenging action.

58364

APTIC NO. 76237

Cooper, D. E.

THE PREVENTION OF ODOURS DURING THE ANAEROBIC DIGESTION OF MEAT WASTE. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975. p. 583-621. 21 refs. (Feb. 17-21.)*

Methods for preventing odors arising from the anaerobic digestion of meat waste are reviewed. Flow equalization, air stripping of dissolved hydrogen sulfide from the digester liquor, and oxidation of the exhaust gas under boilerhouse grates or at the hot base of the chimney stack are particularly effective control procedures. Efficient clarification and the return of seed sludge to the digester are important to odor free operation of both the digester and the stabilization ponds. A slightly alkaline pH (7.4-7.8) ensures that less sulfide is present as dissolved gas and discourages the formation of other odorous compounds like mercaptans and amines. Disturbance of the digester surface and the pumping of liquor into the atmosphere must be avoided for odor free operation. The maintenance of a thin scum on the digester (1.5-2.5 cm) results in a 100-700 fold reduction in hydrogen sulfide release to the atmosphere. This effect is caused by the activities of iron bacteria in symbiotic association with photosynthetic green and red sulfur bacteria. (Author abstract modified)

58365

APTIC NO. 80499

Coppa, Gregory

METHANE: A NEGLECTED RESOURCE. *Chemistry*, 48(11):12-13, Dec. 1975. 4 refs.

Methane production from organic wastes can help solve the problems of energy production and waste disposal. Methane poses no threat to the environment, but other energy sources either contain contaminants that pose problems or are in short supply. Methane combustion products are carbon dioxide and water. Methane can be produced by bacteria in sealed containers of organic waste. It is already being produced in this

way on a small scale for heating homes. However, in cities and towns it is more practical to collect and transport refuse to large digesters. Organic material such as leaves, garbage, and unreclaimable paper would be trucked to the digesters, into which the sewage systems empty. Methane has a relatively low boiling point compared to the other gases produced, and if the mixture is passed through a series of cold traps methane continues to flow but the contaminants freeze or liquefy. Capital costs for building methane producing plants must be compared with the cost of finding, extracting, and transporting natural gas, plus the cost of conventional sewage treatment or land fills. A well engineered operation also would not contribute to water pollution.

58366

APTIC NO. 82830

Cotter, Robert J., Michael J. Keogh, and William D. Heitz

METHOD FOR THE ADSORPTION OF SULFUR DIOXIDE. (Union Carbide Corp., New York) U. S. Pat. 3,876,395. 7p., April 8, 1975. 5 refs.

A method for the adsorption of sulfide dioxide using cross linked water insoluble polymers of N-glycidylpiperazine or N-glycidyl polyalkylpiperazines as the adsorbents is described. No other process can meet the national Air Quality Standards which call for a maximum of 0.14-ppm of SO₂ for a 24-hour period. This method is selective for SO₂ and is applicable for indoor and outdoor air. The gases are contacted with the polymer at a temperature of -10 to 100 C. Although 5% by weight of SO₂ is removed from dry gas mixtures, it is preferred for SO₂ efficient SO₂ removal that the gas mixtures contain at least 0.1% by weight of water vapor. For optimum SO₂ removal efficiency it is preferred that the gas mixture contain from 0.7 to 1.5% by weight of water vapor.

58367

APTIC NO. 82897

Cronkright, Walter A., Jr. and Bernard G. Mandelik

METHOD OF REMOVING SULFUR CONTAINING GASES FROM WASTE GAS. (Pullman Inc., Chicago, Ill.) U. S. Pat. 3,883,639. 9p., May 13, 1975. 3 refs. (Appl. Dec. 21, 1972, 10 claims).

A method of removing sulfur dioxide from waste gases in a short residence time scrubbing system is described. The process involves contacting the gas with an aqueous medium having a pH below 7.1 in an autoregenerative cyclic process using limestone in combination with carbon dioxide. An added amount of a soluble sulfate of a cation such as potassium, lithium, sodium, magnesium, or ammonium or mixtures of these is used to remove the oxides of sulfur. The soluble sulfates are added directly to the aqueous medium or are formed in situ from the known carbonate, bicarbonate, oxide, sulfite, bisulfite, or hydroxide of these cations or ammonia after reaction with the sulfur oxides in the waste gas. Sulfur is removed from the cycle in the form of insoluble calcium sulfite and calcium sulfate. Conventional systems have the disadvantage of a high pressure drop and expend a great deal of energy in moving gas through the scrubbing system. Large liquid to gas ratios are required, which adds increased auxiliary equipment cost to high scrubber cost. (Author abstract modified)

58368

APTIC NO. 83270

Crouch, William B.

PROCESS FOR MAKING A REDUCING GAS. (Texaco, Inc., New York) U. S. Pat. 3,884,648. 6p., May 20, 1975. 6 refs. (Appl. June 28, 1972, 9 claims).

Improvements in the partial oxidation for continuously producing a gas mixture of hydrogen and carbon monoxide from a liquid hydrocarbon fuel, which has a reducing ratio of at least 9 and is suitable for use as a reducing gas, fuel gas, or synthesis gas is described. Gaseous mixtures consisting of hydrogen and carbon monoxide are produced continuously in the reaction zone of a free flow unpacked gas generator by the non-catalytic partial oxidation of a dispersion of liquid hydrocar-

bonaceous fuel in a methane rich gas carrier. For a given soot level, the reducing ratio is greater than the reducing ratio of product gas from a natural gas fired gas generator, or the product gas from a liquid hydrocarbon fired gas generator in which only steam is used as the temperature moderator. In comparison to other processes, where a liquid hydrocarbon fuel is dispersed in a natural gas carrier without the supplemental addition of steam, the addition of the relatively small amounts of steam to the natural gas carrier in this apparatus causes a favorable drop in gas temperature and the free oxygen consumption is reduced, while the net hydrogen and carbon monoxide produced is increased. (Author abstract modified)

58369

APTIC NO. 80952

Cruz, Ibarra E. and Teodorico F. Festin

RESEARCHES ON THE CONVERSION OF AGRICULTURAL WASTES TO ENERGY AT THE UNIVERSITY OF THE PHILIPPINES. (Philippines Univ., Diliman, Quezon City, Coll. of Engineering and Ind. Research Center, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 507-572. 14 refs. (Nov. 3-5.)

Research studies on the conversion of agricultural wastes to energy at the University of the Philippines are described. Two vertical downdraft carbonization retorts were designed to produce charcoal and activated carbon from agricultural wastes. Typical proximate analysis of the charcoal is 81% fixed carbon, 9% volatile matter, 8% moisture, and 2% ash. Other studies on the pyrolysis of coir dust (a waste by-product of coconut fiber production) show the feasibility of coir dust as a source of charcoal briquettes and active carbon powder, hydrogen-carbon monoxide rich gas (coco gas) for mechanical power, for liquid fuels synthesis, or as a hydrogenating agent, and tar and light oil for fuel or for wood preservative.

58370

APTIC NO. 82029

Cullen, Patrick F.

VENTILATING SYSTEM FOR TRAVELING CRANE CABS, EXHAUST HOODS AND THE LIKE. (Crane Air Trac Inc., Burlington (Canada)) U. S. Pat. 3,913,470. 15p., Oct. 21, 1975. 5 refs. (Appl. Aug. 9, 1974, 14 claims).

A ventilating system which supplies air from outside the work area to the cab of a travelling vehicle such as an overhead crane and possesses a supply unit mechanism remote from the crane itself is described. An elongated gas duct is located along the path of vehicle travel and parallel to one of the tracks on which the vehicle travels. A clean air supply line or exhaust line is connected to the gas duct and this line is connected to an air supply unit or an exhausting device. An elongated slot is located along the length of the gas duct, with the slot having spaced apart and opposed edges in the gas duct. A continuous sealing member is located in and along the full length of the slot and normally seals it against outward or inward gas flow.

58371

APTIC NO. 83207

D Olier, George

THERMALLY INSULATED EXHAUST GAS REACTOR. (Raybestos Manhattan, Inc., Trumbull, Conn.) U. S. Pat. 3,899,300. 6p., Aug. 12, 1975. 12 refs. (Appl. March 8, 1974, 5 claims).

An asbestos sheet material particularly suitable for use as thermal insulation in an emission control device for internal combustion engines is described. It consists of chrysotile asbestos fibers and elastomeric binder made of a high molecular weight copolymer of butadiene. The major portion of the asbestos fibers in the sheet are arranged in parallel relation to each other. Prior to use, the sheet is heat treated at a temperature of 525 to 575 F to reduce the weight by 8-10%. This produces an insulating material having a significant degree of resiliency

CONTROL METHODS

58377

at relatively higher temperatures (700-1200 F). Unlike other insulators, this material does not undergo degradation to any significant degree and is capable of being subjected to substantial vibratory forces without breaking down. (Author abstract modified)

58372

APTIC NO. 82139

Date, Tasuku and Shizuo Yagi

REDUCTION OF NOX, HC, AND CO IN THE EXHAUST GASES OF INTERNAL COMBUSTION ENGINES. (Honda Giken Kogyo Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,890,942. 20p., June 24, 1975. 9 refs. (Appl. April 23, 1973, 27 claims).

An improved four-cycle internal combustion engine that overcomes conflicting combustion temperature requirements for simultaneously reducing nitrogen oxides, hydrocarbons, and carbon monoxide is described. The engine operates with a low peak temperature to reduce NOx and a very slow combustion rate and a high prolonged combustion temperature extending for at least 180 deg of the crank angle to reduce hydrocarbons. Carbon monoxide is minimized by means of a lean overall air-fuel ratio. A rich mixture from a first carburetor throat supplies an auxiliary combustion chamber through a valve, and a lean mixture from a second carburetor throat supplies the main combustion chamber through a valve. A torch nozzle restriction connects the chambers. A mixture cloud of relatively rich combustible mixture is formed in the minimum-turbulence main chamber adjacent to the torch nozzle restriction at the time of ignition. The carburetor throttle valves are interconnected for dependent action to change the relative amounts of the air-fuel mixture admitted to each chamber as the engine load varies from idling to full throttle. (Author abstract modified)

58373

APTIC NO. 79643

Dauids, P.

DESULFURIZATION OF WASTE GASES AND FUELS. (Entschwefelung von Abgasen und Brennstoffen). Text in German. Brennstoff-Waerme- Kraft, 27(4):161-167, 1975. 45 refs.

Methods for the desulfurization of flue gases and fuels are reviewed. The limitation of the specific sulfur dioxide emission from large-capacity combustion equipment in West Germany require the reduction of the sulfur content in oil and coal, and/or flue gas desulfurization. Scrubbing methods using alkaline earth compounds such as limestone or lime, alkaline solutions, and diluted sulfuric acid have been developed and experimented with in the USA, Japan, and in West Germany. Disposable sludge or gypsum, as well as concentrated SO2 suitable for sulfuric acid production can be obtained by the different processes. Dry adsorption methods with activated carbon or coke have been experimented with. Catalytic methods use vanadium pentoxide or copper catalyst for SO2 recovery for sulfuric acid production. Coal can be desulfurized mechanically to a residual sulfur content of 1% by mechanical separation of pyrite. Hydrogenation and gasification of coal results in liquid and gaseous products which can be easily desulfurized. Medium oil distillates are easily desulfurized by hydrogenation, while heavy fuel oil can be desulfurized by direct catalytic methods, or by indirect methods, using further distillation. Vacuum distillation residue with high sulfur content, obtained by an indirect method, can be mixed with the desulfurized vacuum distillate, or be combusted in special combustion equipment in flue gas desulfurization installations.

58374

APTIC NO. 79657

Dauids, Peter

EFFLUENTS FROM GAS SCRUBBERS IN INCINERATORS. (Abwaesser der Gaswaesch von Verbrunnungsanlagen). Text in German. Muell Abfall, 7(5):144-146, 1975.

Problems of flue gas cleaning after trash incinerators and related wastewater problems are discussed. The dust, hydrochloric acid, and hydrofluoric acid emissions from waste incinerators are limited to 100 mg/cu m; 100 mg/cu m, and to 5 mg/cu m, respectively, which requires the separation of dust and of the gaseous pollutants, which can be combined in scrubbers. Due to their high water-solubility, HCl and HF can be separated by means of water. If the scrubber effluents are to be discharged into recipients, the specific water consumption should be increased to 10-15 cm m/ton of waste to obtain a dilute effluent. If the effluent is to be treated before discharge, the water consumption should be minimized, which is possible by recirculation and counterflow processes. Thus, it is possible to obtain an acid with 10% concentration, and to achieve a water entrainment of 0.04 cu m/ton of waste. It is also possible to use lime suspension for flue gas scrubbing without wastewater treatment.

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58375

APTIC NO. 81758

Davis, Edwin R.

AUTO POLLUTION GASOLINE TANK CAP ASSEMBLY. (Assignee not given.) U. S. Pat. 3,913,639. 7p., Oct. 21, 1975. 1 ref. (Appl. Dec. 4, 1974, 8 claims).

A gasoline tank cap and fuel delivery nozzle assembly for preventing the escape of gasoline vapors during filling operations is described. The cap portion of the assembly is engaged by the free end portions of first and second tubes of a valved nozzle that are parallel and laterally spaced from one another. The first tube of the gasoline nozzle delivers liquid fuel into the tank, while the second tube receives fuel vapor displaced from the interior of the tank during the filling operation. The nozzle is connected to a pliable hose through which fuel under pressure is supplied to the first tube of the nozzle. The second tube is connected to passage defusing means that may either be an integral part of the hose or tubing secured thereto through which the displaced vapor flows to an area where it may be recovered. (Author abstract modified)

58376

APTIC NO. 82375

De Weese, Daniel P. and Nicholas J. Brozenick

FUME HOOD. (American Air Filter Co., Inc., Louisville, Ky.) U. S. Pat. 3,897,046. 4p., July 29, 1975. 3 refs. (Appl. April 23, 1974, 5 claims).

A fume hood arrangement that prevents the buildup of particulates on the surface thereof is described. A housing having a flow-through inlet and outlet is provided along with a vertically extending baffle skirt surrounding and in fluid tight communication at its lower extremity with the outer periphery of the flow-through inlet as well as in fluid tight communication at its upper extremity with the roof. An opening in the roof that is in fluid communication with the housing outlet is provided so that particulate matter entrained in circulating fumes which is not exhausted through the fume hood is prevented from circulating over and settling on the outer surfaces of the housing. (Author summary modified)

58377

APTIC NO. 83316

Deane, Clifford T.

RECIRCULATING AIR CLEANER. (Assignee not given.) U. S. Pat. 3,884,656. 6p., May 20, 1975. 13 refs. (Appl. June 28, 1974, 10 claims).

A recirculating air cleaner for removing dust and other solids from industrial installations is described. The device has a cylindrical housing into which contaminated air is drawn at one axial end by an impeller assembly together with a spray of water. A dense body of contaminated air and water is centrifugally concentrated radially outwardly of a central body of cleaned air discharged from the exhaust end of the housing by the vortical flow producing action of the impeller assembly. The air and water mixture is separated into a slurry of liquid and solid contaminants and a gas which is recycled back to the intake end of the housing. This device operates more efficiently and with greater capability than the prior art devices. (Author abstract modified)

Demetri, E. P.

EFFECTS OF MAJOR DESIGN AND OPERATING PARAMETERS ON ACHIEVING LOW EMISSIONS FROM GAS TURBINE COMBUSTORS. *J. Fluids Eng.*, 97(3):303-309, Sept. 1975. 11 refs. (Presented at the Joint Fluids Engineering and CSME Conference (Combustion Symposium), Montreal, Canada, May 13-15, 1974.)

The design and performance testing of two low emission combustors for vehicle gas turbine applications are described. The novel features of the combustor designs include the use of air blast fuel nozzles, a relatively high value of pressure-loss factor to promote vigorous mixing, and variable geometry to control the linear air flow distributions. The tests consisted of measuring the combustor performance for independent variable in primary zone equivalence ratio, inlet pressure and temperature, and air flow rate for different variable geometry settings and nozzles. The parameters having the greatest influence on emissions nitrogen oxides, carbon monoxide, and total hydrocarbons were the primary zone equivalence ratio, inlet flow conditions, residence time, and degree of mixing. The observed variations in emissions with these factors are discussed. Guidelines for the future design of low-emission combustors based on the observed effects are presented. (Author abstract modified)

Denisov, V. V. and V. G. Starenchenko

COMPARATIVE ASSESSMENT OF VANADIUM CATALYSTS USED FOR THE REMOVAL OF SULFUR DIOXIDE FROM GASES. (*Sravntel naya otsenka vanadievyykh katalizatorov, ispol'zuemykh dlya ochistki gazov ot SO₂*). Text in Russian. *Khim. Prom. (Moscow)*, no. 6:46-47, 1975. 5 refs.

The SVD and BAV type vanadium catalysts, used for the conversion of sulfur dioxide into sulfur trioxide, were studied at bulk speeds of 2000-13,000/hr in a temperature range of 425-525 C. The efficiency of the two different catalysts was largely the same. However, catalyst type SVD should be used preferentially due to its lower price and greater mechanical strength. It was possible to obey the hygienic standard for SO₂ concentration by the use of the vanadium catalyst if the SO₂ concentration in the waste gas to be purified does not exceed 0.3% at a bulk speed of 13,000/hr. Higher SO₂ concentrations require reduced bulk speed, which also permits the use of lower temperatures within the range investigated. Water vapor in concentrations of up to 10% did not interfere with the SO₂ conversion. A conversion rate of about 90% was reached with an experimental catalysis waste gas cleaner operating in a temperature range of 460-480 C and at a bulk speed of 1700/hr in a ferrite manufacturing plant.

Desty, Denis Henry and John Lionel Thomas

FLARE. (*British Petroleum Co., Ltd., London (England)*) U. S. Pat. 3,915,622. 5p., Oct. 28, 1975. 1 ref. (Appl. Sept. 11, 1974, 6 claims).

A flare for disposing of combustible waste gases is described which incorporates an improved bellows assembly. The flarestack burner tip has a Coanda body placed across the outlet of a high pressure gas line to form an annular slot from which the gas emerges and flows over the Coanda surface. The feed line is a pipe consisting of fixed and moveable parts, with the moveable part partially enclosing the fixed part and forming an annular space. A vertical bellows fits into the annular space, and the upper end of the bellows is attached to the moveable portion of the pipe. Springs acting in series with the bellows may also be attached between the fixed and moveable pipe portions. (Author abstract modified)

Dick, H. Douglas

WASTE MANAGEMENT SYSTEM. (Assignee not given.) U. S. Pat. 3,912,598. 6p., Oct. 14, 1975. 8 refs. (Appl. May 23, 1973, 3 claims).

A waste-management system that produces potable water is described. Water containing suspended wastes is described into a heated chamber, where both water and waste products are vaporized. The chamber contains a catalyst which purifies the water vapor by removing impurity vapors. The purified water vapor is then removed from the chamber and condensed. It is further purified by filtration, producing potable water. The catalytic oxidation of impurity vapors prevents them from giving the recovered water and undesirable taste, odor, or color. The invention also includes flue means for containing and discharging the combustion products resulting from heating the chamber by burning fuel gas, without mingling the combustion products with the vaporization products. The system is adapted to fit onto a manually movable chart, or to be expanded to a size capable of treating domestic or industrial waste. The overall system uses safe temperatures and pressures, and may therefore be utilized in many locations previously unavailable for such purposes. (Author abstract modified)

Diehl, Roy E.

ROAD LOAD MODULATED EXHAUST GAS RECIRCULATION SYSTEM. (Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,885,537. 5p., May 27, 1975. 2 refs. (Appl. Nov. 5, 1973, 4 claims).

A system for controlling the recirculation of exhaust gases of internal combustion engines back into the engine through the intake manifold is described. The carburetor has an exhaust gas recirculation (EGR) vacuum port located above the closed position of the throttle valve. The vacuum provides a signal to an EGR valve to open it upon the attainment of a predetermined vacuum level to pass exhaust gases into the engine intake manifold. The vacuum line contains a pair of flow restrictors and an air bleed device to bleed air into the vacuum line to cause the EGR valve to schedule EGR flow at a rate proportional to load during part throttle operations. In comparison to the other systems, this system affords a finer control of the recirculation of gases by means of apparatus that schedules EGR flow better in proportion to load during part throttle and cruising operations. (Author abstract modified)

Dimenko, V. N.

POLLUTANT EMISSIONS AND THEIR ABATEMENT IN THE FLUE GASES OF THE KIEVENERGO ELECTRIC POWER PLANTS. (*O sostoyanii i merakh snizheniya vrednykh vyrbosov s dymovymi gazami teplovyykh elektrostantsiy energosistemy Kievenergo*). Text in Russian. *Energ. Elektrif.*, no. 2:34, 1975.

A status report is presented on efforts taken to abate harmful air pollutant emissions at the Kievenergo electric power plants. Ash capture is done mainly by means of electrostatic precipitators, Davidson type cyclones, cyclone batteries, and venturi scrubbers. Electrostatic precipitators have efficiencies of 96-98%. Two-step ash capture devices operate at 98% efficiency at one power plant. Much emission control equipment is being modernized or replaced by high-efficiency installations.

Dismukes, Edward B.

CONDITIONING OF FLY ASH WITH SULFUR TRIOXIDE AND AMMONIA (FINAL REPORT). Southern Research Inst., Birmingham, Ala., Tennessee Valley Authority Research Agreement TV36921A, Environmental Protection Agency Contract 68-02-1303, CPA 70-149, Pro-

gram Element 1AB012, ROAP 21ADJ-029, Proj. 2932-3-F, Rept. EPAN600/2-75-015, TVA F75PRS-5, SORI-EAS-75-311, 168p., Aug. 1975. 52 refs.

NTIS: PB 247231/AS

The use of sulfur trioxide and ammonia as flue gas conditioners to improve the electrostatic precipitation of fly ash generated in coal-burning power plants was investigated. The primary role of SO₃ in improving collection appeared to be related to a lowering of fly ash resistivity from the excessive values associated with ash from low-sulfur coals. Ammonia conditioning appeared to involve a space charge enhancement of the electric field in the interelectrode space of the precipitator as well as an increase in the cohesiveness of the collected ash at times. Satisfactory sites of injection were the flue gas ducts in locations upstream from the precipitator, upstream from the combination of a precipitator and mechanical collector, and between the two types of collectors. Fly ash was successfully conditioned at temperatures ranging from 110 to at least 160 C. (Author abstract modified)

58385

APTIC NO. 76364

Dixit, D. K.

AIR POLLUTION DUE TO AUTOMOBILES. *Indian J. Environ. Health*, 17(3):250-266, July 1975. 48 refs.

The sources and control of automobile engine emissions are discussed. The exhaust gas pollutants consist of hydrocarbons, carbon monoxide, nitrogen oxides, and lead compounds. The exhaust emissions contribute 100% of automotive emissions of carbon monoxide, nitrogen oxides, and lead compounds. The typical breakdown for hydrocarbons is exhaust sources, 55%; evaporative sources, 20%; and crankcase sources, 25%. The effects of the following operating variables on exhaust emissions are discussed: air-fuel ratio, spark timing, combined effects of air fuel ratio and spark timing, combustion chamber surface-volume ratio, compression ratio, combustion chamber deposits, and coolant temperature. The two main approaches to minimizing exhaust emissions are modifications in the engine design and operating variables and treatment of exhaust gases after emission from the engine. Both evaporative emissions and crankcase emissions can be controlled by engine design and operating variables and proper engine maintenance.

58386

APTIC NO. 82814

Dixon, Bruce E., Marcus I. Hoffman, III, and Milton A. Walls

PARTICULATE AND/OR GAS FILTERS AND ASSOCIATED FILTERING EQUIPMENT TO PURIFY AIR TO BE BREATHED BY PERSONS IN VEHICLES AND/OR BUILDINGS, AND MANUFACTURE AND INSTALLATION OF THESE FILTERS. (*Air Purification Systems, Inc., Grand Junction, Colo.*) U. S. Pat. 3,870,495. 14p., March 11, 1975. 11 refs. (Appl. Dec. 22, 1972, 22 claims).

To capture particulates in incoming outside air, random fibers were used in filters. Two or more laminations of the random fiber filtering materials were used; the resulting mismatched arrangement of nonwoven laid fibers eliminated any probable alignment of oversize filter material openings resulting from production variances in specified filter size openings. Activated carbon was mixed with or bonded to the partial filtering nonwoven laid fibers for gas filtering, including odor capture. No intolerable pressure drops were created. The filters are made in pleated conical configurations. Manufacturing apparatus for the filters is also provided. (Author abstract modified)

58387

APTIC NO. 70609

Dlaska, Herbert

SMELTING OF LEAD ORE AND STORAGE BATTERY SCRAP BY THE ROUND BUBBLE METHOD OF THE BLEIBERGER BERGWERKS-UNION AG (BBU). (*Die Verhuetung von Bleierz und Akkumulatorenschrott nach*

dem BBU-Rundherdverfahren). Text in German. *Erzmetall*, 28(1):6-12, Jan. 1975. 1 ref.

A new method for recycling of storage battery scrap is described. The batteries are removed from the casings and passed to a dryer, which is necessary because battery scrap is usually very wet. Here part of the lead filler material falls out. The waste gases of the dryer are first cleaned in a cyclone and then in a cloth filter. The dried material goes from the main treatment process to the screening and wind sifting equipment. The fine material falls through the vibrating screen and is passed by a screw conveyor to the moisturizer. The separation dust is vacuumed off. This process is supported by pressurized air injected for the bottom. A second wind sifting process takes place at the end of the screen where the coarse material falls onto a conveyor belt. The separators are removed from the air flow in a cyclone and dumped. The grid plates coming from the vibrating screen go to impaction pulverizer where the remaining filler material is removed united with the fine material from the vibration screen and the cyclone succeeding the dryer, wetted and smelted like ore. The grid material is molten in special furnaces. The great disadvantage of the method is the high sulfur dioxide emission level.

58388

APTIC NO. 82366

Doherty, Keith Stanley

CONTROLLING THE CONCENTRATION OF IMPURITIES IN A GAS STREAM. (*Petrocarbon Developments Ltd., Manchester (England)*) U. S. Pat. 3,897,226. 14p., July 29, 1975. 6 refs. (Appl. April 19, 1973, 19 claims).

A process for controlling the concentration of impurities in a gas stream is described which is especially applicable to upgrading the quality of regenerating streams. At least a portion of the gas stream is diverted through an adsorption zone during the time that the concentration of the impurity in the gas stream exceeds a predetermined level. After passage through the adsorption zone, the diverted portion of the gas stream is recombined with the remainder of the gas stream. The diversion of at least a portion of the gas stream to the adsorption zone is continued after the concentration of the impurity in the gas stream has dropped below a specified level in order to desorb the impurity adsorbed by the adsorbent. The proportion of the gas stream that is diverted is controlled so as to maintain the overall concentration of the impurity in the recombined stream at or below a given level.

58389

APTIC NO. 83108

Dojka, Marian

THE USE OF CALCIUM CARBONATE WASTE FOR CLEANING WASTE GASES CONTAINING SULFUR OXIDES. (*Zastosowanie odpadowego węgla wapniowego do oczyszczania gazów odlotowych zawierających tlenki siarki*). Text in Polish. *Przemysł Chem.*, 54(7):393-394, July 1975. 6 refs.

An inexpensive method for restricting emissions of sulfur oxides from sulfuric acid factories and heating and power plants was sought under laboratory conditions. The role of the sulfur dioxide and sulfur trioxide absorbent was fulfilled by an aqueous suspension of calcium carbonate waste containing approximately 90% CaCO₃ derived from the manufacture of sulfur ore by the flotation method. Tests were conducted on the model of an absorption column and on an industrial scale. The mean efficiency for cleaning waste gases containing 0.1-0.8% of SO₂ as well as 0.1-0.2 percent parts of SO₃ exceeded 75%. The production of CaCO₃ waste from sulfur ore flotation significantly surpasses the demand to neutralize locally emitted sulfur oxides.

58390

APTIC NO. 76438

Dowdy, M. W., F. W. Hoehn, and D. C. Griffin

LEAN MIXTURE ENGINE TESTING AND EVALUATION PROGRAM. Preprint, California Inst. of Tech., Pasadena, Jet Propulsion Lab., 10p., 1975. 9 refs.

(Presented at the Intersociety Energy Conversion Engineering Conference, 10th, Newark, Del., Aug. 17-22, 1975.)

Exhaust emission and fuel consumption data for a 350 cu in. Chevrolet V-8 engine modified for lean operation with gasoline are presented. The lean burn engine achieved peak thermal efficiency at an equivalence ratio of 0.75 and a spark advance of 60 deg. A 10% reduction in brake specific fuel consumption under these conditions was observed in comparison with a stock engine, although the nitrogen oxide and hydrocarbon emissions from the lean burn engine was higher. The NOx emissions performance of the stock engine was matched and accompanied by a 6% reduction in fuel consumption when spark retard and/or slightly lower equivalence ratios were used. Hydrocarbon emissions exceeded stock values in all cases, although exhaust temperatures were adequate to provide hydrocarbon oxidation in a catalytic converter. (Author abstract modified)

58391

APTIC NO. 82841

Drehman, Lewis E. and Floyd E. Farha

LEAD FREE MOTOR FUEL PRODUCTION. (Phillips Petroleum Co., Bartlesville, Okla.) U. S. Pat. 3,883,418. Sp., May 13, 1975. 14 refs. (Appl. Jan. 2, 1973, 6 claims).

A two-stage reforming process for the production of high-octane unleaded motor fuel from low-octane naphthas is described. The paraffinic raffinate from an intermediate extractive distillation step is reformed over a steam-active catalyst. Several product streams produced during the various process steps are combined to produce a high-octane Pb-free motor fuel. Conventional methods depend upon the use of Pb alkyls as additives to improve antiknock characteristics of gasolines. The demand for clean, unpolluted air places an emphasis on developing high octane gasolines that do not use Pb compounds. (Author abstract modified)

58392

APTIC NO. 84146

Dubach, Paul

SAVING OF ENERGY BY RECYCLING OF REFUSE. (Energieersparnisse durch Wiederverwertung von Altstoffen). Text in German. Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, 8p., 20 refs. (Nov. 3-5.)

For glass, wrecked cars, aluminum and waste paper, it has been determined that collection and preparation processes have positive energy gains. Factors influencing energy yield are route schedules, number of collections, site of recycling plants and compactness of refuse. Detailed studies have been made on total energy consumption in glass making. The composition of cars and the energy for their production as well as for aluminum production and paper making are discussed. With respect to pulp preparation, recycling paper offers great savings in the way of water consumption. Optimal methodology requires consideration also of the environment and natural resources. In Switzerland, total energy consumption for 1973 amounted to 200 billion kWh; recycling has reduced by 0.5% with a possible future reduction of up to 2-5%.

58393

APTIC NO. 82154

Duhaut, Pierre and Jean Miquel

CATALYST FOR HYDROCARBON CONVERSION. (Societe Francaise des Produits pour Catalyse, Rueil-Malmaison (France)) U. S. Pat. 3,898,178. 5p., Aug. 5, 1975. 10 refs. (Appl. Dec. 13, 1972, 13 claims).

A catalyst which offers improved yields of hydrocarbon conversion in reforming reactions is described. The catalyst consists of an alumina carrier and 0.005-1% of platinum, 0.005-1% of iridium, and 0.005-5% of uranium, vanadium, or gallium. The catalyst may also contain from 0.1-10% of a halogen, e.g., chlorine or fluorine. The catalyst may be used in many known hydrocarbon conversion reactions in which platinum catalyst are used.

56

AIR POLLUTION ABSTRACTS, JUNE 1976

58394

APTIC NO. 82556

Dulin, Jacques M. and Edward C. Rosar

AIR POLLUTION CONTROL PROCESS FOR GLASS MANUFACTURE. (Industrial Resources, Inc., Chicago, Ill.) U. S. Pat. 3,880,629. 11p., April 29, 1975. 5 refs. (Appl. July 9, 1973, 32 claims).

An air pollution control process for glass manufacture is described. Sulfur oxides and particulates are collected in a baghouse in which dry powdered Nahcolite ore is used in the dual function of a particulates filter aid and as an absorbent which reacts with the SOx to form principally sodium sulfite/sulfate or the corresponding hydrosulfite, sulfide, hydro-, tetra-, and pentasulfides, bisulfite, bisulfate, peroxydisulfate, pyrosulfate, or pyrosulfite. An aqueous sodium alkali, preferably raw or calcined crude Nahcolite ore dissolved in water, is sprayed at a controlled rate into the hot (200-1500 F) flue gases coming off the glass furnaces. The SOx reacts with the sodium alkali solution and the heat of the flue gas dries out the resultant sodium sulfur oxide salts which, along with particulates are collected in the baghouse. The baghouse filter cake is recycled to the glass furnace so that the process is in material balance without producing potentially water pollutable wastes. (Author abstract modified)

58395

APTIC NO. 76513

Dunn, Kenneth S.

INCINERATION S ROLE IN ULTIMATE DISPOSAL OF PROCESS WASTES. Chem. Eng./Deskbook, vol. 1975:141-150, Oct. 6, 1975. 16 refs.

Emission collection for incineration process wastes is discussed. The particle size of the dust is the most important factor to consider in choosing the most efficient type of dust collection. Acids in gases must be accurately identified in order to assess the need for special materials in the construction of the collector. Most applications that contain fume or fine dust particles below 5 micron in size require high efficiency collectors. The Environmental Protection Agency standards are set at 0.2 grains/std cu ft of dry flue gas corrected to 12% carbon dioxide. Wet scrubbing systems are able to tackle the combined problem of acid gases and particulates. High efficiency scrubbers also find application in dust control where either high temperature or catalytic incineration does not prove wholly successful.

58396

APTIC NO. 82559

Dupps, John A., Sr.

HIGH EFFICIENCY VAPOR CONTROL SYSTEM. (The Dupps Co., Germantown, Ohio) U. S. Pat. 3,883,329. 9p., May 13, 1975. 8 refs. (Appl. Jan. 23, 1974, 7 claims).

A vapor control system is described in which the noxious and odoriferous vapors are first condensed and the remaining non-condensable vapors are subject to a scrubbing operation to wash and dilute the residual gases. The scrubbed gases are subject to additional treatments selectively utilizing chemical gaseous and incinerating mediums to further purify the effluent so that it is effectively odor-free when discharged from the system. The system enables the user to obtain maximum odor control utilizing the treatment mediums which are most efficient and economical for the operating conditions encountered. (Author abstract modified)

58397

APTIC NO. 80290

Durie, R. A. and M. Y. Smith

THE PRESENT STATUS OF TECHNIQUES FOR THE CONTROL OF OXIDES OF NITROGEN FROM STATIONARY COMBUSTION PLANT. The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 134-158. 36 refs. (Feb. 17-21.)

Factors affecting the formation and control of nitric oxide generated from stationary combustion sources are reviewed.

Although the mechanism of NO formation is not fully understood, important factors involved include peak temperature, residence time at or near the peak temperature, and oxygen concentration. Measures for controlling NO formation include low excess air firing, two-stage combustion, flue gas recirculation, burner design modification, and decreasing the preheat temperature of the air and water or steam injection to the furnace. Uncertainties relating to the mode of NO formation and to the effects of boiler design and operating conditions make the quantitative estimation of flue gas NO levels from a given plant impossible. The effect of NO emission legislation on the design of new power station boilers is discussed.

58398

APTIC NO. 83699

Dyens, Pierre J.

USE OF SPRAY SCRUBBERS FOR INDUSTRIAL GAS CLEANING. (*Utilisation des laveurs a pulverisation pour l'épuration des gaz industriels*). Text in French. Inform. Chim., no. 148:199-202, Oct. 1975.

Spray scrubbers, in which the cleansing fluid runs parallel to the gas, require minimum maintenance, give good results at variable flow rates, and minimize charge loss. To reduce mercury emissions from brine electrolysis with a mercury cathode, a three-story KT scrubber is used. The first story works with fresh chlorinated brine which absorbs the mercury and discharges the excess chlorine. Mercury concentrations are reduced from 5 to 0.1 mg/cu m. The scrubbers are also used to clean the air coming from the used brine dechlorination system. The initial concentration of chlorine, 9000 mg/cu m in 2000 cu m/hr of air, fell to 3 mg/cu m or less following passage through a two-story scrubber fed with a solution of 5-10% soda. In the case of storage or discharge of chemicals, the scrubbers can wash the fumes escaping from the storage tanks, clean the air coming from the cisterns while they are filled from the storage bins, and clean the compressed air which is used in the emptying process. To reduce methyl mercaptan and other foul smelling organic derivatives from pharmaceutical manufacture, a suction network with ventilation apparatus is installed above the various sources of emission.

58399

APTIC NO. 83750

Eads, Ralph and Charles Langdon Campbell

CENTRIFUGAL TUYERE FOR GAS SEPARATOR. (*Heat/Fluid Engineering Corp., Tulsa, Okla.*) U. S. Pat. 3,885,934. 6p., May 27, 1975. 7 refs. (Appl. June 19, 1973, 9 claims).

A multi-bladed tuyere for imparting a helical motion to a moving gas stream is described. The blades of the tuyere overlap in axial projection so that there is no through open area, and the gas stream impinges the blades. The trailing edge of each blade includes a lip which projects in an upstream direction to trap liquids impinging the blades and causes them to drain radially outwardly. The lip terminates short of the outermost end of the blade, causing the trapped liquid to flow off the blade and onto the vessel wall. This separator overcomes the problems in other devices which are characterized by limited flow ranges and excessive pressure drops. (Author abstract modified)

58400

APTIC NO. 84134

Edye, Eckart

SOLAR ENERGY FUNDAMENTALS AND PROSPECTS OF TECHNICAL UTILIZATION. (*Solar-Energie, Grundlagen und Aussichten fuer eine technische Nutzung*). Text in German. Chem.-Ing. Tech., 47(21):873-879, 1975. 10 refs.

Possibilities and limits of the development of solar energy for heating and hot water supply as well as for electric power stations are discussed. Although solar energy in the form of direct radiation is inexhaustible, geographical location, differences in radiation between day and night, cloud cover, and seasonal differences make it difficult to utilize. Furthermore,

the proper technology is only at its inception and realization of projects under consideration would be extremely expensive. As long as no breakthrough in power storage is accomplished, the use of solar energy for transportation has to be disregarded. In industry, the generally required higher heat level for successful operation makes its potential rather doubtful. Solar energy would best be suitable for household warm-water supply during the summer months. Solar energy is also available in the form of the kinetic energy of wind and flowing water, potential energy reserves of high-altitude dams, and the temperature gradient in the water of tropical oceans, but practical possibilities are limited. Potential energy from high dams is limited to climatically favorable regions (Norway, Switzerland) where it can reach a very significant level in the total power generation. Although utilization of temperature differences in tropical waters had great potential, its technological development is still uncertain and without importance for West Germany. Limited prospects for a noteworthy contribution to the energy supply do not preclude the use of direct solar radiation in special fields by direct conversion into electrical energy by means of thermoelectric or photoelectric processes and by storing heat for heating or for use in a cyclical process.

58401

APTIC NO. 84268

Efendiev, T. B.

NITROGEN OXIDES FORMATION IN STEAM GENERATORS FIRING GAS AND MASOUT. (*Obrazovanie oksidov azota v gazomazutnykh parogeneratorakh*). Text in Russian. Teploenergetika, no. 9:20-23, 1975. 5 refs.

Calculation and measurement of nitric oxide formation in combustion chambers firing natural gas and fuel oil are presented. Up to 60% of the final nitric oxide was formed within the zone with the highest temperature of the combustion chamber. A nomogram is given for the determination of the NO concentration in combustion chambers as a function of the air-excess coefficients, flue gas recirculation, and other factors. As a result of the low-intensity mixing of the recirculated flue gas with the combustion gases within the critical, high-temperature flame zone, the influence of flue gas recirculation on NO formation is substantially weaker than calculated.

58402

APTIC NO. 84129

Egger, K. W. and H. Wigger

INSPECTION OF OIL HEATERS IN THE CITY OF BERN - RESULTS OF THE FIRST HALF OF THE PROGRAM. (*Kontrolle der Oelfeuerungsanlagen der Stadt Bern - Ergebnisse bei Halbzeit*). Text in German. Gesundheitstech., no. 11:250-252, 1975.

A statistical evaluation of furnace checkups for the purpose of limiting pollutant emission from heating installations within the City of Bern is described. The technical testing of the installations involved chimney draft, determination of soot number (Bacharach) by hand pump, flue gas temperature, oil check, and general condition. Heating installation owners or attendants and proper municipal departments received a copy of the heating report. If necessary, the oil furnace had to be rechecked within 2 wk by an expert service company. The results were submitted to the Department of Municipal Environmental Protection. The fee for the checkup was \$8 for 3 yr. The mean lowered oil consumption due to the testing was in the neighborhood of 10%. Of 10,000 oil furnaces in the city, 4800 were checked out during 1974/75; 55% were taken care of by service subscription. Of the latter, an average of 28% were cited for atmospheric pollution as compared to 45% of those without service subscription. It was found that many home owners paid insufficient attention to the condition of their furnaces, which resulted in complaints about 12% of all furnace owners and subsequent repairs. Four owners had to be warned, 30 requested an extension of the inspection period, and 56 had to pay a re-checking fee of \$17 due to a new complaint. Heating control led to faultless maintenance of oil furnaces by an ever-increasing number of owners.

58403

APTIC NO. 82071

Eguchi, Yoshihiro

DETECTING AND CONTROL METHOD AND APPARATUS. (Hochiki Corp., Tokyo (Japan)) U. S. Pat. 3,909,814. 8p., Sept. 30, 1975. 9 refs. (Appl. July 11, 1973, 11 claims).

A method and apparatus for detecting changes in physical phenomena and for subsequently controlling response devices in accordance with such detected changes are described. The apparatus may be a smoke detector or sensor which is operable to transmit a signal to a receiver when the detector or sensor senses a small amount of smoke. The detector visually indicates on a display window of the receiver the position or location where the detector or sensor is installed and actuates an emergency alarm device along with a first group of response devices such as emergency doors and the like to be opened. When the fire spreads and a more dense smoke is detected by the sensor, a second group of response devices such as fire doors, smoke exhausting devices, smoke blocking curtain walls, and fire extinguishers are actuated.

58404

APTIC NO. 76600

Ehrich, Werner

WASTE HEAT BOILERS FITTED BEHIND THE REGENERATORS OF GLASS TANK FURNACES. (Abhitzeessel hinter Regeneratoren von Glasschmelzwanen). Text in German. *Glastech. Ber.*, 48(9):173-180, 1975.

The scarcity and increased cost of primary energy sources have increased the desirability of extracting useful heat from waste gases. Various heat recovery methods and criteria for evaluating them are considered. Data on the heat content and useful heat of the waste gases relative to the energy content of the gases leaving the regenerators are given. Tabulated values of representative costs of primary and secondary energy allow determination of the economic limits for replacing primary energy by converted waste heat. The use of these criteria and data is illustrated with a sample economic calculation for an existing installation. The operating characteristics of existing waste heat installations are given and the factors influencing life and yield are considered. The construction needed to achieve the necessary forced draught in the installation is discussed. The waste gas control necessary to ensure efficient operation is discussed.

58405

APTIC NO. 83102

Eknayan, Hrant

POLLUTION MINIMIZING DEVICE FOR INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,882, 677. 7p., May 13, 1975. 6 refs. (Appl. July 25, 1973, 11 claims).

A pollution reducing device for internal combustion engines is described which reduces the amount of hydrocarbon, carbon monoxide, and nitrogen oxides to a very small quantity. All previous devices which are reasonably effective in reducing the contaminants require frequent servicing or periodic replacement of the catalyst, or are expensive, or require increased consumption of fuel for a given amount of work output of the engine. The inlet opening of a chamber is connected to the exhaust manifold so that the combustion products pass through the chamber to an exit opening. The chamber contains a pair of baskets which are made up of thin copper wire strands placed side by side. Blue sparks are provided at the region of the chamber between the two baskets and also at the carburetor inlet opening. Atmospheric air is introduced into the baskets to mingle with the combustion products entering it from the engine. The presence of this hot air and the copper and the sparks at the gap produces or augments chemical reactions, resulting in nearly complete elimination of the contaminants. (Author abstract modified)

58

58406

APTIC NO. 82992

Ekstedt, Edward E.

COMBUSTOR SYSTEMS. (General Electric Co., Cincinnati, Ohio) U. S. Pat. 3,899,884. 6p., Aug. 19, 1975. 7 refs. (Appl. Dec. 2, 1970, 3 claims).

Improvements in combustor systems, particularly in the generation of a hot gas stream as in gas turbine engines are described. Combustor systems, as employed in gas turbine engines, comprise a spray nozzle which injects fuel into a combustion zone. Once ignited, continuous flame front is maintained in the combustion chamber as fuel and pressurized air flow therein and a high energy, hot gas stream is discharged. There is a problem in minimizing smoke generated in the combustion process and discharged to the atmosphere. In this system, the venturi maintains desirable low smoke formation while spacing the flame front of the ignited mixture from the spray nozzle to reduce its temperature and thus prevent undesired carbon formation thereon. Unlike other systems, the frequency of maintenance of the fuel nozzles is not increased, while the smoke is reduced. (Author abstract modified)

58407

APTIC NO. 81477

Elsbett, Ludwig

PISTON WITH CENTRAL COMBUSTION CHAMBER FOR INJECTION TYPE INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,906,924. 5p., Sept. 23, 1975. 9 refs. (Appl. June 21, 1974, 5 claims).

A piston for reciprocating internal combustion engines which will ensure optimum combustion of the fuel/air mixture by efficient temperature control of the combustion chamber is described. It is of a straightforward and weight-saving design and affords low wear guidance in the cylinder. It protects the piston rings from excess heating, which is an improvement over other pistons. The piston is designed to prevent liquid fuel from being swept by the swirling motion of the combustion air onto too cool an area of the combustion chamber wall where it evaporates very slowly and, consequently, a proportion of unburnt fuel is discharged from the combustion chamber or emitted through the exhaust. Such unburnt fuel is the cause of blue smoke in diesel engines. Since the temperatures at which blue smoke is liable to form are well established, it is possible with the piston to match the amount of heat insulation, the wall thickness, and heat conductivity of the incandescent member in a simple manner to suit control requirements.

58408

APTIC NO. 82987

Eltze, Georg

DRIVE UNIT WITH AN INTERNAL COMBUSTION ENGINE AND WITH AN AUTOMATIC CHANGE-SPEED TRANSMISSION CONNECTED IN THE OUTPUT THEREOF. (Daimler-Benz Aktiengesellschaft, Stuttgart (Federal Republic of Germany)) U. S. Pat. 3,882,739. 5p., May 13, 1975. 10 refs. (Appl. Nov. 16, 1972, 12 claims).

A drive unit with an internal combustion engine is described which has an automatic change speed transmission connected in the output. The vacuum in the suction pipe of the engine operating with externally controlled ignition varies with the engine load. A modulating control magnitude influenced by the vacuum is utilized in the change speed transmission for the control of the shifting servo-motors and/or for the change of the shifting servo-force in dependence on the engine load. Unlike other devices this unit permits the accurate coordination of the transmission ratio in the change speed transmission to the engine load even if the ignition is adjusted to a delayed ignition for avoiding exhaust gas contamination.

58409

APTIC NO. 82340

Endo, Kunio, Junji Kawarada, Motoharu Sueishi, Susumu Harada, and Hideaki Norimatsu

AIR-FUEL RATIO FEEDBACK TYPE FUEL INJECTION SYSTEM. (Nippondenso Co., Ltd., Kariya (Japan)) U. S.

Pat. 3,895,611. 21p., July 22, 1975. 3 refs. (Appl. Oct. 12, 1973, 9 claims).

An electronic fuel injection system with air-fuel ratio feedback control is described which overcomes prior art difficulties associated with compensating for changing engine operating conditions. The device includes a computing unit for generating injection pulses which determine the duration of the opening of electromagnetic valves connected to a fuel line in which the pressure is maintained at a constant value. The system also includes a means for detecting the concentration of oxygen in the exhaust gases, an air-fuel ratio discriminating circuit for comparing the detected signal from the oxygen concentration detector with a preset value, a circuit for generating a sampling signal having a predetermined frequency for sampling the discrimination signals from the air-fuel ratio discriminator circuit, and a system for providing negative feedback to the computing unit to reverse the discrimination signal. (Author abstract modified)

58410

APTIC NO. 83766

Endo, Ryo, Tetsuo Takeyama, Masakatsu Murata, and Klazuo Kadoi

REMOVAL OF NITROGEN OXIDES. (Sanka chisso no jyokyo hoho) Text in Japanese. (Tore Co., Ltd. (Japan)) Japan. Pat. Sho 50-15752. 3p., June 7, 1975. (Appl. Sept. 28, 1971, 1 claim).

Waste gases containing nitrogen oxides were contacted with aluminosilicate of the forgiassite type having a composition given by $(0.5-1.0) \text{ Na}_2\text{O}$, Al_2O_3 , $(3-6) \text{ SiO}_2$. Nitrogen oxides were adsorbed on the aluminosilicate and removed from the waste gases. Thus, various adsorbing agents were packed in a glass column, 1 cm inner diameter. The grains of adsorbing agents were about 2 mm in diameter. The whole system was heated to 350 C and evacuated for 2 hr, then cooled. A nitrogen gas containing 0.45 vol% nitrogen dioxide was passed through the column at a rate of 5 cm/sec. When synthetic forgiassite having a composition given by $\text{Na}_2\text{O}.\text{Al}_2\text{O}_3.4.8 \text{ SiO}_2$ was packed in the column, NO_2 exited from the column after 160 min, whereas it exited after 90 min when activated carbon was used for adsorption. The amount of adsorbed NO_2 was 0.087 g/g activated carbon; it was 0.320 g on the adsorption agent of this invention. The preferred temperature of adsorption is below 70 C and preferably below 40 C. The required time of contact of the gas with the adsorption agent was 2.5 sec.

58411

APTIC NO. 76249

Engdahl, Richard B.

CLEAN ENERGY FROM COAL. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 12p., 1975. 4 refs. (Presented at the Air Pollution Control Association, East Central Section, Dayton, Ohio, Sept. 18, 1975.)

Methods for obtaining clean energy from coal are reviewed. The nearest to practical application for making gas from coal is the Wellman-Galusha gasifier. The Wellman unit can be operated either with air and steam, yielding a low-energy gas of about 170 Btu/standard cu ft, or with oxygen and steam, yielding an intermediate energy gas of about 280 Btu/standard cu ft. However, the sulfur remains in the gas, and the thermal efficiency may drop below 50% if the system is to operate free of outside utilities. Other alternatives for deriving clean energy from coal include the removal of sulfur during coal preparation, the installation of a flue gas scrubber, and the use of limestone fluidized bed combustion systems. The most promising flue gas desulfurization system for industrial boilers appears to be the double alkali method. This technique uses soluble sodium salts as the aqueous scrubbing medium and thus avoids the scaling problems associated with lime and limestone systems.

58412

APTIC NO. 83036

Engdahl, Richard B. and Keshava S. Murthy

UPDATING THE APPLICABILITY OF SCRUBBERS.

Preprint, Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., 17p., 1975. 25 refs. (Presented at the Pollution Control Congress, 4th, International, Cleveland, Ohio, Oct. 20-23, 1975.)

The applicability of various scrubbing techniques to the control of relatively dilute sulfur dioxide emissions from fuel-burning boilers is reviewed. Types of systems discussed include: lime/limestone, magnesia, and sodium processes. Lime scrubbing appears nearest to widespread applicability, but none of the straight lime systems currently in operation has demonstrated satisfactory reliability on high-sulfur Eastern coal when operating in closed loop. The major barrier to successful long-term reliability is the lack of understanding of the chemistry of alkaline scrubbing, especially in very large equipment where flow, mixing, and reactions are difficult to measure and control.

58413

APTIC NO. 79712

Enke, Christian G.

THE IMPORTANCE OF GAS DESULFURIZATION. (Die Bedeutung der Gaseschwefelung). Text in German. Wasser Luft Betrieb, 19(7):412-414, 1975.

Methods for the separation of sulfur compounds from natural gas after the Claus process and from waste gases generated in viscose fiber production are described. The Claus oven waste gases containing hydrogen sulfide and sulfur dioxide are led through activated carbon and finely dispersed activated alumina for an overall sulfur separation efficiency of 99%. The residual H_2S can be separated in the form of elementary sulfur in a second activated carbon stage with stoichiometric oxygen supply. Desorption is done with oxygen-free nitrogen at 450 C. Hydrogen sulfide present in waste gases generated in viscose fiber production is separated on a special activated carbon, and is immediately oxidized to elementary sulfur by means of a catalyst. Carbon disulfide is adsorbed on activated carbon. The residual H_2S and CS_2 concentrations in the purified waste gases are 1 ppm and 50 ppm, respectively. Carbon disulfide is desorbed with steam, the steam-carbon disulfide mixture is precipitated, and the water is stripped with air. The wastewater contains practically no CS_2 , and the latter is recycled within the production process.

58414

APTIC NO. 76191

Ensor, D. S., B. S. Jackson, S. Calvert, C. Lake, D. V.

Wallon, R. E. Nilan, K. S. Campbell, T. A. Cahill, and R. G. Flocchini

EVALUATION OF A PARTICULATE SCRUBBER ON A COAL-FIRED UTILITY BOILER (FINAL REPORT). Meteorology Research, Inc., Altadena, Calif., Environmental Protection Agency Contract 68-02-1802, Program Element 1AB012, ROAP 21ADL-092, Rept. EPA-600/2-75-074, MRI 75 FR-1352, 213p., Nov. 1975. 39 refs.

A mobile-bed scrubber (Turbulent Contact Absorber) was evaluated on a full-scale coal-fired utility boiler for fly ash removal. The scrubber nominally operated at its design particulate removal efficiency of 95%. The concentration of submicron particles, however, was greatly influenced by mist entrainment which resulted in a difference of aerosol penetration through the scrubber as a function of elemental composition and outlet submicron particle concentration, independent of pressure drop through the scrubber. The use of the penetration as a function of particle size for developing performance models was unfeasible because of the variable concentration of submicron entrained particles. The estimated 1972 installed cost was \$29/kW, and the annual operating cost was estimated at 0.5 mills/kW-hr (75% availability). (Author abstract modified)

58415

58415

Epstein, Michael

APTIC NO. 75965

EPA ALKALI SCRUBBING TEST FACILITY: SUMMARY OF TESTING THROUGH OCTOBER 1974. Bechtel Corp., San Francisco, Calif., Environmental Protection Agency Contract PH 22-68-67, Program Element 1AB013, Rept. EPA-650/2-75-047, 489p., June 1975. 19 refs.

NTIS: PB 244901/AS

Test results from March 1972 to October 1974 from a lime/limestone scrubbing test facility for removing sulfur dioxide and particulates from flue gases are described. The facility consists of three parallel scrubbers: a venturi spray tower, a Turbulent Contact Absorber (TCA), and a marble bed absorber, each able to treat a 10 MW equivalent of flue gas from a coal fired boiler. Limestone factorial tests were conducted on all three scrubbers to determine the effects of the independent variables on SO₂ and particulate removal. Limestone reliability verification tests were conducted on all three scrubbers to define regions for scale free operation. Lime and limestone reliability tests were conducted on the venturi spray tower and TCA systems to demonstrate long term reliability, primarily of the mist elimination systems. Mathematical models have been developed for predicting system performance. Test results show that scrubber internals can be kept relatively free of scale if the sulfate saturation of the scrubber liquor is kept below about 135%. The TCA mist elimination system has remained essentially clean over a 1000 hr period at a superficial gas velocity of 8.6 ft/sec. The spray tower has a chevron mist eliminator with provision for underside and topside wash. Neither intermittent nor continuous bottomsides wash prevented solids buildup at 6.7 ft/sec superficial velocity and 8% slurry solids concentration. A recent test has shown that a combination of intermittent topside and bottomsides wash can keep the mist eliminator free of solids at the above conditions. (Author abstract modified)

58416

Epstein, Michael

APTIC NO. 76009

EPA ALKALI SCRUBBING TEST FACILITY: ADVANCED PROGRAM (FIRST PROGRESS REPORT). Bechtel Corp., San Francisco, Calif., Environmental Protection Agency Contract 68-02-1814, Program Element 1AB013, ROAP 21AAZ-001, Rept. EPA-600/2-75-050, 172p., Sept. 1975. 4 refs.

Particulate removal efficiency and reliability data were collected for a prototype lime/limestone wet scrubbing sulfur dioxide and particulate removal facility at the Tennessee Valley Authority's Shawnee thermal power station. A venturi/spray tower system operating with lime slurry was maintained essentially clean in an 823-hour run at 8.0 ft/sec gas velocity and 8% slurry solids, and a turbulent contact absorber with limestone was operated successfully in an 1835-hour run at 8.6 ft/sec gas velocity and 15% slurry solids. Both scrubber systems operated with better than 99% particulate removal efficiency and with outlet grain loadings of 0.01-0.03 grains/standard cu ft. (Author abstract modified)

58417

Erhard, Wolfgang

APTIC NO. 79639

THERMAL DEODORIZER. A NEW METHOD FOR ODOR ELIMINATION IN THE STUTTGART ABATTOIR. (Thermische Desodorierungsanlage. Ein neuer Weg der Geruchsbeseitigung mit Erdgas im Stuttgarter Schlachthof). Text in German. Gas Wasserfach, Gas/Erdgas (Munich), 116(4):172-176, 1975.

A thermal deodorizer installed in the animal carcass processing unit of a large slaughterhouse in Stuttgart is described. Animal wastes, carcasses and confiscated materials are processed to animal feed in a closed system, and the malodorous waste gases, containing fatty acids and mercaptans, are collected from different points of the system. Part of the waste gases is heated up to 180 C in a heat exchanger by the hot flue gases,

AIR POLLUTION ABSTRACTS, JUNE 1976

and is used as combustion air. The malodorous substances in the waste gas are oxidized to water vapor and carbon dioxide in a natural gas-fired furnace at 750 C. The residence time of the waste gases in the furnace is between 0.3 and 0.5 sec.

58418

Esche, Michael

APTIC NO. 84315

RESULTS OF EXPERIMENTS WITH A FLUE GAS DESULFURIZATION PLANT BY THE HOELTER PROCESS. (Versuchsergebnisse mit einer Rauchgasentschwefelungsanlage nach dem Hoelter-Verfahren). Text in German. Saarberg-Hoelter Umwelttechnik GmbH, Saarbruecken, (Federal Republic of Germany). (Presented at the Desulfurization of Fuels and Combustion Gases, Seminar, 2nd, Washington, D. C., 1975, p. 1-9. (Nov. 11-20.)

The initial results of an experimental smoke desulfurization installation used in a coal-operated electric power plant are described. The prototype installation employed a wet-gas purification process developed by Hoelter and was designed for a smoke gas flow of 125,000 cu nm/hr conforming to the smoke gas quantity of a 40 Mw coal-operated power station. The hot smoke gases with a maximal load of 2500 mg/cu nm (875 ppm sulfur dioxide) passed through an electrostatic filter, then a conditioning sector in 4 lines where the gas temperature was lowered and washed with a special washing fluid. In an adjacent separator, the gas was thoroughly separated from the washing water and re-washed in a low-pressure venturi scrubber (line A). Lines B, C and D were equipped with high-pressure venturis. The smoke gases were dried in a horizontal separator phase and the washing fluid loaded with dust and SO₂ was centrifuged and the impurities carried away. The fluid was collected in a tank and processed (patented method). Chlorine ions were injected, followed by a conversion into a calcium sulfate mass by oxidation. The latter was dehydrated by 50% and then deposited. The decisive advantage of the Hoelter Process was the alkalized washing water containing Cl(-) ions, preventing incrustation and clogging of the operation. The electric power consumption of the desulfurization installation was considerably reduced and the rate of desulfurization over a period of several months was about 95%. The residue of about 95% CaSO₄ has a potential for further use in the construction industry. Specific total cost including capital amortization was less than 0.2 cent/kwh.

58419

Estelle, Charles, Jr.

APTIC NO. 80461

DESIGN OF ACID RESISTANT CHIMNEY AND RELATED CONSTRUCTION PROBLEMS OF AN OPERATING MANUFACTURING PLANT. Combustion, 47(5):27-33, Nov. 1975. 4 refs.

The design of a new acid resistant fume stack in an operating mill is described. The chimney is the world's largest solid acid brick chimney at over 358 ft. It is designed with the standard cantilevered beam formula to support a wind pressure of 25 lb/sq ft of projected area with zero tension in all sections. The masonry column is a tapered design, built of solid, low-porosity, acid resistant brick. All concrete surfaces on the interior of the pedestal and flues are protected with a squeegeed asphalt membrane reinforced with glass fabric. This membrane is protected with a self supporting acid brick lining.

58420

Evans, Glen R.

APTIC NO. 83748

INTERNAL COMBUSTION AND STEAM PRESSURE GENERATOR WITH POWERED EXPANSION ENGINE. (Assignee not given.) U. S. Pat. 3,885,390. 6p., May 27, 1975. 5 refs. (Appl. Feb. 12, 1974, 5 claims).

An internal combustion engine and steam pressure generator of high thermal efficiency is described. It is particularly well adapted to supplying adequate steam or other gas pressure to a steam-type positive displacement expansion engine. Unlike

other devices this device conforms to conventional forms of manufacture, is of simple construction and easy to use, and is economically feasible and relatively trouble free in operation. A mixture of atomized liquid fuel and air is continuously burned in a first chamber and the resultant highly heated expanding gaseous by-products of combustion pass through a restricted flow passage into a second chamber. The finely atomized water is instantaneously flashed into steam to provide tremendous volumes of expanded gases for ducting to the associated expansion engine at temperatures appreciably reduced relative to the temperature of the by-products of combustion generated in the first chamber of the pressure vessel. (Author abstract modified)

58421

APTIC NO. 76446

Farmer, A. D.

A DEVICE FOR SUBSTANTIALLY REDUCING POLLUTION FROM PETROL DRIVEN VEHICLES. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 252-261. (Feb. 17-21.)*

A device which reduces carbon monoxide, hydrocarbon, and nitrogen oxide emissions from automobiles by improving the air/fuel mixture of internal combustion engines is described. The control device consists of a venturi and air bleed combination which is attached to a flange that is mounted between the carburetor and the inlet manifold. The air bleed is partly open during the idle mode of operation and reaches its maximum opening during deceleration. The air bleed is closed during the cruise and acceleration modes. The venturi operates at all times by creating a lower pressure zone at the throat which enhances the vaporization of droplets in the air-fuel mixture as well as encouraging better mixing. Emissions tests using the 1970 United States Federal Driving Cycle indicate that reductions in carbon monoxide, nitrogen oxides, and hydrocarbons of 90, 90, and 75%, respectively, are feasible with the control device. Fuel savings of 8-15% are also possible.

58422

APTIC NO. 83664

Farmer, R. C.

METHANOL--A NEW FUEL SOURCE? *Gas Turbine Int., 16(3):38-40, May/June 1975.*

The exhaust emissions of coal derived methanol were measured from gas turbine engines. Emissions of nitrogen oxides were 74% less than with no. 2 oil, and well below proposed Environmental Protection Agency regulation limits. Carbon monoxide emissions were higher. The increase was 30 ppm higher than for no. 2 distillate, approximately a 100% increase. A methanol burning turbine is projected to be below expected EPA CO regulations during the most productive and efficient phases of power output, above 17 MW.

58423

APTIC NO. 76232

Farrier, P. M. and F. I. Coates

INFLUENTIAL FACTORS IN THE CONTROL OF EFFLUENT EMISSIONS FROM THE BLUFF ALUMINUM SMELTER. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 511-527. 6 refs. (Feb. 17-21.)*

Procedures for the control and monitoring of particulate and fluoride emissions from an aluminum smelter are described. The monitoring program includes measurements of control equipment efficiency and the determination of fluoride levels in the surrounding air as well as in flora and fauna. Fluoride emissions from pot operation are minimized as a result of the installation of a prebake cell. The emissions from aluminum reduction pots are collected in a common duct and passed through a multicyclone for the removal of particulates. The cleansed effluent is then discharged through a 137-meter high stack at a velocity of 1.6 m/sec. Each pot is completely hooded, and an effluent containment in excess of 97.5% is constantly maintained.

58424

APTIC NO. 83667

Fattinger, V.

WASHING OUT OF METAL OXIDES AND NOXIOUS GASES FROM WASTE INCINERATOR FLUE GASES TO ACHIEVE THE MAXIMUM POSSIBLE DEGREE OF WATER POLLUTION PREVENTION. (*Auswaschen von Metalloxiden und Schadgasen aus Abfallverbrennungsanlagen unter weitgehender Vermeidung einer Abwasser verschmutzung*). Text in German. CIBA-GEIGY AG, Basel (Switzerland), *Convers. Refuse Energy, Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, 6p. 7 refs. (Nov. 3-5.)*

A multi-stage system for the separation of particulate matter, sulfur dioxide, hydrogen chloride and hydrogen fluoride from waste incinerator flue gases, developed by CIBA-GEIGY A.G. is described. The system adopts a controlled counterflow of flue gas and scrubbing liquid. It is composed of a coarse dust separator which also cools the gas and conditions the scrubbing liquid. The second stage is a scrubber for the removal of acid gaseous components and for the wetting of fine suspended dust. The third stage is a fine dust separator in the form of venturi scrubber or other types. The SO₂ content of the flue gas is reduced by over 75%. No alkalies are used in the scrubbing liquid, but it is possible to increase the efficiency by the use of alkalies. The dilute sludge generated is neutralized with the incinerator ashes.

58425

APTIC NO. 84431

Faure, F., R. B. Jacko, and R. Squires

THE COLLECTION EFFICIENCY OF AN ELECTROSTATIC PRECIPITATOR FOR TRACE METALS FROM AN OPEN HEARTH FURNACE. *Preprint, Purdue Univ., West Lafayette, Ind., 5p., 1975 (?) 3 refs.*

The collection efficiency of an electrostatic precipitator for trace metals from an open hearth furnace was determined. Emission tests in June 1974 both upstream and downstream resulted in an average particulate collection efficiency of 97.7%. Average particulate concentration is 0.349 gr/SCF upstream and 0.008 gr/SCF downstream. Total particulate mass emission rates vary between 35 and 94 lb/hr and result in calculated emission factors of 0.16 and 0.46 lb particulate/ton of steel produced. The mass median diameter of the particles entering the precipitator is 1.56 micron with the mass median diameter leaving 1.0 micron. (Author abstract modified)

58426

APTIC NO. 80105

Feistel, P. P., R. Duerrfeld, K. H. Van Heek, and H. Juentgen
LAYOUT OF AN INTERNALLY HEATED GAS GENERATOR FOR THE STEAM GASIFICATION OF COAL. *Nucl. Eng. Design, 34(1):147-155, Oct. 1975. 13 refs.*

The design of an internally heated gas generator for the steam gasification of coal is discussed. Reaction kinetics, heat transfer, and material tests are significant for the layout of a full scale gas generator. Material specifications for a gasifier, characterized by a fluid bed volume of 318 cu cm and a heat transferring area of 4000 sq m are determined. The data are used to determine the gasification throughput from the heat balance. Throughputs of about 50 t/hr of coal are possible for a single gas generator; the helium outlet temperature of the HTR is 950 C. (Author abstract modified)

58427

APTIC NO. 82666

Feldner, George F.

FLUE GAS DISTRIBUTOR AND RADIATOR FOR UNIFORM HEAT TRANSFER. (*The Lummus Co., Bloomfield, N. J.*) U. S. Pat. 3,882,826. 6p., May 13, 1975. 4 refs. (Appl. Aug. 21, 1974, 15 claims).

An improvement in tubular fluid heaters in which a fluid is heated by being passed through tubes in a radiant heating section is described. A plurality of generally horizontally disposed

ducts are located in the upper portion of the radiant chamber. There are openings by which flue gases enter the duct and are exhausted to the convection section and stack, thus improving the overall flue gas distribution in the radiant chamber. Operation results in obtaining optimal heat transfer to the fluid flowing through the tubes and in the case of pyrolysis or steam reforming of hydrocarbons results in optimal yields and conversions.

58428

APTIC NO. 83615

Feng, Chung Liao

SYSTEM FOR VAPORIZING OIL. (Selas Corp. of America, Dresher, Pa.) U. S. Pat. 3,885,904. 4p., May 27, 1975. 3 refs. (Appl. March 1, 1974, 4 claims).

A method and apparatus for vaporizing a liquid hydrocarbon and supplying the vapor to a furnace or other equipment in which it is combusted are described. The system is specifically adapted for jobs using open burners that must be accurately controlled. The system makes use of a separate oil-fired air heater for vaporizing the oil used directly as fuel. Various controls are applied to the system to insure that the oil is completely vaporized and mixed with air to form a combustible mixture. The oil is kept in a vaporized condition until used. (Author summary modified)

58429

APTIC NO. 82075

Fennessy, Francis J.

APPARATUS FOR REACTIVATING CATALYST SURFACES IN AN EXHAUST SYSTEM. (United Technologies Corp., Hartford, Conn.) U. S. Pat. 3,910,772. 3p., Oct. 7, 1975. 13 refs. (Appl. Jan. 22, 1974, 3 claims).

A device for periodically reactivating the catalyst surfaces in an antipollution exhaust system for internal combustion engines is described. The catalyst surface is in the form of a cylinder over which the exhaust gases flow and the catalyst serves to eliminate the pollutants from the gases either by converting the pollutant gases to nonpolluting gases or by adsorption or adsorption of the pollutant material. The catalyst surface is reactivated by intermittently passing abrasive material over the catalyst surface. The abrasive is in the form of blocks and these blocks are intermittently moved over the catalyst surface by a mechanism actuated by an engine function.

58430

APTIC NO. 80251

Fenton, D. M., Byron B. Woertz, J. C. Brocoff, and Earl J. Jirus

TAIL GAS CLEAN-UP WITH THE BEAVON SULFUR REMOVAL PROCESS. National Petroleum Refiners Association, Washington, D. C., Natl. Petrol. Refiners Assoc. Annu. Meet., San Antonio, Tex., 1975, 12p. (March 23-25.)

Criteria for selection of tail gas cleanup units include reliability and ability to handle Claus plant upsets, ability to produce a high purity treated gas with no need for incineration, superior ability to separate hydrogen sulfide and carbon dioxide, simplicity of equipment, nontoxicity of chemicals, production of high purity elemental sulfur, and reasonable capital and operating costs. The Beavon Sulfur Removal Process was installed and operated successfully for almost 2 yr. The total investment in a BSRP unit, including royalty, is about 75% the investment of the parent sulfur plant. Approximate utility requirements and costs for treating the tail gas from a sulfur plant, operating at 95% efficiency, are given. There are presently 9 BSRP units, operating in 7 locations, and 18 other BSRP units presently in the engineering or construction stage.

58431

APTIC NO. 72836

Ferguson, Colin R., Guido A. Danieli, John B. Heywood, and James C. Keck

TIME RESOLVED MEASUREMENTS OF EXHAUST COMPOSITION AND FLOW RATE IN A WANKEL ENGINE. Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 16p., 1975. 22 refs. (Presented at

the Society of Automotive Engineers Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750024.)

Fluid motions were examined within the Wankel engine by experimentally time resolving the exhaust composition and mass flow rate. Measurements were made of exhaust histories of unburned hydrocarbons, carbon monoxide, carbon dioxide, oxygen, and nitric oxide. The exhaust flow can be divided into two distinct phases: a leading gas low in hydrocarbons and high in NO followed by a trailing gas high in hydrocarbons and low in NO. Calculations of time resolved equivalence ratio throughout the exhaust process show no evidence of a stratified combustion. The exhaust mass flow rate is time resolved by forcing the flow to be locally quasi-steady at an orifice placed in the exhaust pipe. Results are consistent with the measurements. Predictions are made of time resolved mass flow rate which compare favorably to the experimental data base. The composition and flow histories provide sufficient information to calculate the time resolved flow rates of the individual species measured. Most NO is exhausted with the leading gas while most of the hydrocarbons are exhausted with the trailing gas. (Author abstract modified)

58432

APTIC NO. 76582

Ferretti, E. J., K. C. Baczewski, and A. C. Mengon

COAL GASIFICATION FOR INDUSTRIAL FUEL. Energy Commun., 1(5): 433-494, 1975.

Coal gasification for industrial fuel is discussed and various gas producers are described. Methods of gasification include fixed, stirred, and fluidized bed units, as well as suspension, or entrained flow reactors. After gasification, which is blowing with oxygen or air and steam, the hot raw gas is generally quenched and scrubbed to remove fines, tars, or other impurities which may be carried over from the gasifier. The various types of gas producers that are available and under development are discussed including their mode of operation, the type of coal that can be handled, the disposition of ash, and the extent of commercial development. The moving bed reactor types include: Lurgi, Riley-Morgan, Wellman-Galusha, Wilputte, Stirred reactor, Il Gas Integrale; the fluidized reactor includes: Winkler Exxon, BCR, Acceptor, Char Energy Demo., Synthane, Battelle Carbide, Westinghouse, U-Gas, Ignifluid; the entrained flow reactor includes: Koppers-Totzek, Garrett R and D, Babcock and Wilcox, BiGas, Texaco; reactors heated by recirculated solids include: Toscoal and Lurgi Ruhr-gas; reactors containing molten media as heat carrier include: Patgas, Kellogg, Otto-Rummel; and reactors that gasify hydrogenation include: Hydrane and Hygas.

58433

APTIC NO. 82310

Ferri, Antonio

APPARATUS FOR REDUCING FORMATION OF OXIDES OF NITROGEN IN COMBUSTION PROCESSES. (Advanced Technology Labs., Inc., Westbury, N. Y.) U. S. Pat. 3,890,088. 12p., June 17, 1975. 11 refs. (Appl. Nov. 22, 1972, 10 claims).

A combustion process for reducing the formation of nitrogen oxides is described in which combustion occurs via a thermal diffusion flame rather than a mass diffusion flame. The fuel is completely vaporized and physically combined with air to provide a uniform mixture on a molecular scale. The mixture has an equivalence ratio of less than unity and burns via the formation of a thermal diffusion flame at temperatures below those encountered with stoichiometric combustion. The lower combustion temperature results in reduced nitrogen oxide formation. (Author abstract modified)

58434

APTIC NO. 79710

Fichtel, Konrad

DEGASSING OR GASIFICATION? CURRENT PROBLEMS OF TRASH PYROLYSIS. (Entgasen oder Vergasen? Aktuelle Probleme der Pyrolyse von

CONTROL METHODS

58439

Hausmuell). Text in German. Tech. Umweltmag., 3:28-33, 1975. 15 refs.

A description and environmental impact assessment of the Destrugas degassing process, and of the Landgard and Andco-Torrax gasification processes developed for the pyrolysis of trash are presented. According to the Destrugas process, trash with a maximum particle size of 10 cm is fed into a corundum-lined vertical tower where the oils and tars formed between 300 and 600 C are further decomposed to hydrogen, carbon dioxide, carbon monoxide, methane, and carbon between 800 and 1000 C. After vapor condensation and scrubbing, a fuel gas with a calorific value of almost 3000 kcal/N cu m is obtained. This gas contains 10 ppm sulfur dioxide and sulfur trioxide, 0.5 ppm hydrofluoric acid, 10 ppm of hydrochloric acid, and 10 mg of soot per N cu m. The Landgard gasification process, generating waste gases containing hydrogen, carbon monoxide, methane, ethylene, benzene, benzene derivatives, ammonia, tars, acids, bases, paraffins, olefins, aromatics, and highly polluted wastewater, does not alleviate the environmental problems of waste disposal. The Andco-Torrax high-temperature gasification process generates waste gases containing sulfur dioxide, hydrochloric acid, hydrofluoric acid, and even toxic heavy metal vapors. With respect to clean air maintenance, the degassing process generating utilizable fuel gas is preferred to the gasification processes.

58435

APTIC NO. 82446

Fichtel, Konrad

TRASH PYROLYSIS: FOUR PROCESSES ARE RIPE FOR TESTING. (Hausmuell-Pyrolyse: Vier Verfahren koennen erprobt werden). Text in German. Umwelt (Duesseldorf), 5(4):42-50, 1975. 17 refs.

Four different trash pyrolysis processes (Destrugas process, Landguard process, Andco-Torrax process, and Purox process) are described and compared with regard to their technological and environmental advantages. The Destrugas and Purox processes require purification of the pyrolysis gas before combustion, which is not problematic because of the small gas volumes generated, while the Landguard Andco-Torrax processes offer but slight or no environmental advantages over the waste incineration process. Of the four different methods, the Destrugas method is most promising and is expected to become a valid alternative for incineration. In this process, crushed wastes are gradually heated up to 900-1000 C for cracking of the organic components. The process gas obtained contains water vapor, carbon dioxide, hydrogen, carbon monoxide, methane, and small quantities of higher hydrocarbons. The process gases are cooled and scrubbed to obtain a fuel gas composed essentially of hydrogen, CO, CO₂, and methane, which can be stored for later. The flue gases generated during the combustion of this gas contain 10 ppm of sulfur dioxide plus sulfur trioxide, 0.5 ppm of hydrofluoric acid, 10 ppm of hydrochloric acid, and 10 mg of soot/N cu m.

58436

APTIC NO. 82028

Filss, Peter

METHOD OF PURIFYING GASES USING ROTABLE PLATES HAVING A SOLID REACTION SURFACE LAYER THEREON. (Kernforschungsanlage Julich Gesellschaft mit beschränkter Haftung, Julich (West Germany)) U. S. Pat. 3,907,967. 7p., Sept. 23, 1975. 1 ref. (Appl. July 19, 1973, 7 claims).

A method for purifying waste gases is described which allows for the continuous regeneration of the solid material-surface layer without interruption of the process. A solid surface layer which is adapted to absorb the impurities in the gas is formed on rotatable discs, portions of which temporarily protrude from a liquid-containing vessel. After contact of the solid surface layer with the gas, the exhausted portion of the surface layer is replaced successively by a new surface layer portion formed by the wetting of disc portions as the latter pass through the liquid in the container. (Author abstract modified)

58437

APTIC NO. 82537

Fischer, Francis A.

AUXILIARY FLUID INJECTION SYSTEM FOR INTERNAL COMBUSTION ENGINE. (Assignee not given.) U. S. Pat. 3,898,965. 5p., Aug. 12, 1975. 8 refs. (Appl. Aug. 20, 1973, 5 claims).

A system for introducing fluid such as air to a lower region of the combustion chamber of an internal combustion engine during the intake stroke of the engine is described. Any unburned fuel in the combustion chamber is fully burned and discharged from the exhaust system as burnt gas rather than unburned hydrocarbon. Inefficient burning in a typical engine is due to insufficient air in the chamber to permit complete combustion of all fuel, especially during operation of the engine when it is throttled back, as when a vehicle powered by the engine is coasting downhill. Prolonged idling of the engine also leads to the same overly rich fuel condition. A source of fluid under pressure is provided to a passageway which includes a plenum chamber defined in the head of the cylinder. A valve selectively admits air, which passes from the plenum to this lower region of the combustion chamber. The cylinder head defines a depending conically shaped baffle which cooperates with a conically shaped recess in the head of the piston to define the auxiliary chamber or lower region of the combustion chamber.

58438

APTIC NO. 82422

Fleming, Donald K.

TAIL GAS NITROGEN OXIDE ABATEMENT PROCESS. (Inst. of Gas Tech., Chicago, Ill.) U. S. Pat. 3,897,539. 7p., July 29, 1975. 4 refs. (Appl. July 26, 1973, 6 claims).

A method and system for abating nitrogen oxides in tail gas from acid production are described. The system includes a rotary wheel reactor which has a preheat zone to raise the temperature of the inlet tail gas stream to ignition temperature, and a reaction zone wherein the nitrogen oxides are reduced. The heat of reaction is removed as it is generated for preheating the tail gas stream. The heat buildup, which is damaging to the catalysts in the reactor and to ancillary material equipment, is prevented. This is an improvement over other systems. (Author abstract modified)

58439

APTIC NO. 82815

Flynn, Peter C. and Sieghard E. Wanke

EFFECT OF PRETREATMENT AND ADSORPTION CONDITIONS ON GAS ADSORPTION BY SUPPORTED METAL CATALYSTS. Can. J. Chem. Eng., 53(6):636-640, Dec. 1975. 26 refs. (Presented at the IV Simposio Iberoamericano de Catalysis, Mexico, Nov. 1974.)

The influence of pretreatment and adsorption conditions on the adsorption of oxygen and hydrogen on supported platinum and ruthenium catalysts was studied. Three commercial and three prepared catalysts were used. Adsorption was measured in both static and dynamic adsorption systems. The effect of outgassing time on oxygen uptake was measured by reducing a commercial catalyst in flowing hydrogen for 2 hr at 500 C, then outgassing in flowing helium at 500 C for varying time periods. The catalyst was then cooled to 0 C and its uptake of oxygen was measured in the dynamic system. The effect of reduction time on oxygen uptake was studied by reducing two commercial catalysts in flowing hydrogen for varying time periods and temperatures, and outgassing them in flowing helium at the reduction temperature for 1 or 2 hr. The catalyst was then cooled and its uptake of oxygen was measured in the dynamic system. The effect of the rate of addition of oxygen on oxygen uptake was studied using oxygen diluted to varying extents with helium. The gas uptake for the three prepared catalysts was compared in the static and dynamic systems. Gas adsorption uptakes on supported metal catalysts are a function of adsorbate, reduction and outgassing conditions, adsorption temperature, and adsorption system. Nevertheless, reproducible results were obtained if the same procedures

were employed in repetitive experiments. Oxygen uptakes are a strong function of adsorption temperature while hydrogen uptakes are relatively constant in the 0 to 50 C range. (Author abstract modified)

58440

APTIC NO. 82887

Ford, James A. and Sheldon H. Butt

CATALYST FOR THE REDUCTION OF AUTOMOBILE EXHAUST GASES. (Olin Corp., New Haven, Conn.) U. S. Pat. 3,876,456. 6p., April 8, 1975. 3 refs. (Appl. Aug. 2, 1973, 9 claims).

A catalyst for the reduction of automobile pollution is described. The catalyst consists of a nickel alloy substrate having specified composition and a surface layer containing from 10-50% copper. The Cu concentration varies from 10-50% at the surface to 0% within the substrate. This catalyst possesses a unique combination of effectiveness, durability, and low cost not found in other systems. (Author abstract modified)

58441

APTIC NO. 83290

Ford, James A. and Sheldon H. Butt

CATALYST FOR THE REDUCTION OF AUTOMOBILE EXHAUST GASES. (Olin Corp., New Haven, Conn.) U. S. Pat. 3,886,095. 5p., May 27, 1975. 3 refs. (Appl. Nov. 12, 1973, 17 claims).

A catalyst for the reduction of automobile pollution and a method of preparing the catalyst are described. The catalyst consists of a nickel alloy substrate having a specified composition and a surface layer containing from 10-50% copper. The surface layer is applied by pressure welding or by electroplating. This composite catalyst overcomes difficulties of the prior art by providing an oxidation resistant substrate containing alloying constituents which are extremely resistant to oxidation, sulfidation, and nitridation attack. The substrate constituents retain their oxidation resistance even when diluted by the diffusion of Cu from the surface layers into the substrate. The oxidation resistant substrate consists of a nickel base alloy containing aluminum and silicon and optionally containing chromium. (Author abstract modified)

58442

APTIC NO. 84442

Ford, R.

PRACTICABLE METHODS OF CONTROLLING PARTICULATE EMISSIONS IN THE CEMENT INDUSTRY. Air Pollution Control Association, Pittsburgh, Pa., Quebec Section, Air Pollution Control Assoc. Quebec Section, Conf. Strategy Air Pollution Manage, St. Jovite, Quebec, 1975, p. 99-109. (May 25-27.)

Methods for controlling particulate emissions in the cement industry are outlined. Dust emissions resulting from the transport of rock to crushers and screening systems are controlled by bag filters and the use of water spray systems using wetting agents. Either electrostatic precipitators or filter bag collectors are used to reduce dust emissions from operations involving the grinding and drying of raw mix. Filter bag collectors are also used to control dust emissions generated by raw mix blending and feed systems. Waste gases from kilns are controlled with electrostatic precipitators. Normally, all collected dust is returned to the process unless the raw materials contain relatively high alkalis. Exhaust gas from grate coolers is partially used as secondary preheated combustion air in kilns, with the rest being discharged via a dust collector. Glass and Nomex bag filters are used for controlling cooler vent gases usually, though electrostatic precipitators are also used in some plants if the exhaust gases are cool enough. Dust emissions during clinker handling and storage are reduced by carrying out these functions under a roof cover. Filter bag collectors are used to handle emissions from clinker grinding and finishing mills.

58443

APTIC NO. 82733

Ford, W. R.

PRACTICABLE METHODS OF CONTROLLING PARTICULATE EMISSIONS IN CEMENT INDUSTRY. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1975. (Presented at the Air Pollution Control Association Quebec Section Meeting, St. Jovite, Quebec, May 27, 1975.)

Current practical control technology used in the cement industry is discussed. It is practically impossible to treat dust emissions from the quarrying operation, but they are not major. The dust emissions from crushing and screening are controlled by bag filters and the use of water spray systems using wetting agents. Dust is controlled in raw material handling and stockpiling by using carriers entirely hooded or covered, with all discharge or transfer points equipped with bag filter collectors. Dust removal from grinding the raw mix can be done either by electrostatic precipitator or by bag filter. Dust emission problems from aeration of the silos and the conveying systems are resolved by bag filter collectors. Various control methods are used for the burning process and clinker cooling. Control methods for clinker handling and storage are described. Bag filters or electrostatic precipitators are used to control emissions from clinker grinding. The main field of application for fiber filters is the reduction of the dust emissions of crushers, mills, screening installations, transporting equipment, packing machines, and cement storage silos. The trend is towards dust-free centralized control rooms where all the operations are remotely and automatically controlled. Continuous and efficient maintenance is required. The increasing technical refinement in the installations tended to less trouble-free operation and more sensitivity to irregularities in the conditions of the raw material and the operation.

58444

APTIC NO. 82571

Forsten, Herman H.

IMPORTANCE OF GAS STREAM ANALYSIS IN SELECTING BAGHOUSE FABRIC. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1975. (Presented at the Air Pollution Control Association Specialty Conference on the User and Fabric Filtration Equipment, Buffalo, N. Y., Oct. 5-7, 1975.)

Field studies of the effects of gas stream composition on Nomex baghouse fabric are reported. Nomex is currently being used successfully in a wide range of industrial applications at temperatures up to about 400 F and brief surges up to about 600 F. The primary cause of short bag life is hydrolytic degradation, i.e., scission of the polymer chain by moisture catalyzed by an acid or base. Key factors governing the rate of hydrolysis are: operating temperature, moisture level, and acid gas level, low moisture levels and low levels of acid gases (e.g., sulfur dioxide, sulfur trioxide, and chloride) are recommended for maximum bag life. (Author summary modified)

58445

APTIC NO. 82241

Foster, Chester L.

METHOD AND APPARATUS FOR TREATING POLLUTED AIR ALONG AUTO TRAFFIC ARTERIES. (Assignee not given.) U. S. Pat. 3,898,059. 12p., Aug. 5, 1975. 1 ref. (Appl. May 9, 1973, 5 claims).

A method for collecting and treating polluted air along crowded automobile thoroughfares is described. The method involves channelling the polluted air through unused but controlled portions of existing storm sewers to air treatment plants for scrubbing, washing, and filtering. Purified air is then recirculated back to sidewalk areas along the streets affected by heavy automobile traffic. (Author abstract modified)

58446

APTIC NO. 82116

Fowler, Charles P. and Robert N. Balluff

HEAT SHIELD FOR EXHAUST CONDUITS. (Tenneco Inc., Racine, Wis.) U. S. Pat. 3,908,372. 3p., Sept. 30, 1975. 3 refs. (Appl. Aug. 15, 1974, 1 claim).

A flexible heat shield for the outside of a conduit of an internal combustion engine exhaust system is described that is particularly applicable to vehicles equipped with catalytic converters. The shield contains numerous metal coils, preferably parts of a helical strip, which longitudinally overlap on one edge and have standoff flanges engaging the conduit on the other edge. The coils are perforated in accordance with a program that locates the holes on the bottom side of the conduit. (Author abstract modified)

58447

APTIC NO. 82083

Fox, Hans G.

ROTARY PISTON ENGINE HAVING A TURBO-SUPERCHARGER. (Assignee not given.) U. S. Pat. 3,908,608. 6p., Sept. 30, 1975. 9 refs. (Appl. Aug. 16, 1973, 3 claims).

A rotary piston engine having a turbo-supercharger is described. Conventional rotary engines have severe engine speed restrictions imposed by the limited strength of the crank, a combustion chamber that is not readily adaptable to mass production, and a less than desirable combustion chamber surface area. These and other rotary engine problems are solved to a large extent through an almost circular combustion chamber that accommodates at least two mutually perpendicular vanes. These vanes are mounted in a rotor that is slightly offset from the center of the combustion chamber. The vanes are slidable relative to each other and intersect on a line that is coincident with the rotational axis of the rotor. This center of rotation is offset from the center of the chamber. The fuel air mixture preferably is supplied to the combustion chamber through a supercharger, carburetor, and check valve. Engine exhaust back pressure can be selectively throttled to control pressure in the chamber and to drive a turbine that is coupled to the supercharger. (Author abstract modified)

58448

APTIC NO. 82096

Fox, Roger Geoffrey and Vernon Frederick Cox

GAS TURBINE ENGINE COMBUSTION EQUIPMENT. (Rolls-Royce (1971) Ltd., London (England)) U. S. Pat. 3,913,318. 5p., Oct. 21, 1975. 6 refs. (Appl. Aug. 8, 1973, 2 claims).

A vaporizer for a gas turbine engine is described which is designed to receive air and fuel separately and to mix them together. The vaporizer has a shroud surrounding the stem and is used to provide a cooling air space. It is provided with holes from which the cooling air issues radially. The radial jets improve combustion efficiency and reduce smoke emission. This radial emission of cooling air improves the temperature distribution in the combustion chamber and leads to improved combustion efficiency. The problem of the burning out of the branches of a branched vaporizer which occurs in conventional vaporizers with air passing from the shroud axially of the stem is overcome. (Author abstract modified)

58449

APTIC NO. 79656

Franke, F. H., W. Wenzel, M. Mohtadi and G. Subklew

INVESTIGATIONS CONCERNING WASTE GAS AND WASTE WATER PURIFICATION WITH ADSORPTION COKE FROM SOFT COAL. (Untersuchungen zur Abgas- und Abwasserreinigung mit Adsorptionskoksen aus Braunkohle). Text in German. Brennstoff-Waerme-Kraft, 27(7):284-287, 1975. 5 refs.

Conventional brown coal cokes with minimum pretreatment were tested for their suitability for use as adsorbents for sulfur dioxide from flue gases and for phenols for wastewaters. Experiments with a model flue gas with 0.025% SO₂ showed initial separation efficiencies over 95%. However, except for a few types of coke, the efficiency dropped sharply after less than 30 min of operation. Experiments with actual flue gases from a copper sintering plant showed that the inherent dust content reduced the maximum separation efficiency to a range between 85% and 95%. Here, the decrease in the efficiency

took place at a slower pace. The findings indicate the suitability of brown coal coke for SO₂ separation from flue gases.

58450

APTIC NO. 80192

Franke, F. H., W. Wenzel, M. Mohtadi, and G. Subklew

STUDIES OF WASTE GAS AND WASTEWATER CLEANING BY MEANS OF ADSORBENT COKE MADE FROM BROWN COAL. (Untersuchungen zur Abgas- und Abwasserreinigung mit Adsorptionskoksen aus Braunkohle). Text in German. Brennstoff-Waerme-Kraft, 27(7):284-287, July 1975. 5 refs.

The suitability of 12 different commercial brown coal cokes for the adsorption of sulfur dioxide from flue gases and of phenols and other pollutants from wastewaters was studied in laboratory experiments. All brown coal cokes with sufficiently large specific surface was found suitable for the adsorptive removal of SO₂ from model and real sintering gases. The presence of dust in real sintering flue gas did not interfere with SO₂ adsorption. The initial SO₂ adsorption rates were usually over 80% and the rates measured after 60 min were between 60% and 80%. The adsorption temperature was 125 C, and the initial SO₂ concentration was 0.025% by volume. The dust concentration in the raw flue gas was 30 g/N cu m.

58451

APTIC NO. 83214

Franklin, Nick F.

VENTURI EXHAUST COOLER. (Wagner Mining Equipment, Inc., Portland, Oreg.) U. S. Pat. 3,875,745. 4p., April 8, 1975. 10 refs. (Appl. Sept. 10, 1973, 3 claims).

A venturi exhaust cooler for internal combustion engines is described. The kinetic energy of the exhaust gas is utilized as a driving fluid to aspirate a large volume of quiescent ambient air as a driven fluid for cooling the exhaust gas quickly in a very short path of travel. This mode of operation is an improvement over conventional injector and ejector devices utilizing a current of air as the driving fluid. This device utilizes the Coanda effect to introduce the exhaust gas around a lip on one end of a venturi tube, causing the gas to flow in a high velocity film adherent to the inner surface of the tube. This laminar flow draws in a large volume flow of air through the center of the venturi, cooling 1000 F exhaust gas down almost to ambient temperature in a distance of a few inches.

58452

APTIC NO. 82853

Frantz, Virgil L.

MULTI-STAGE AIR FILTER ASSEMBLY. (Graham-White Sales Corp., Salem, Va.) U. S. Pat. 3,876,400. 6p., April 8, 1975. 17 refs. (Appl. Nov. 1, 1973, 8 claims).

An improved multi-stage air filter assembly is described which combines centrifugal, gravity, and condensation separations with filtration through porous filter media for filtering contaminants from forced air. The filtering is performed in a plural part housing having removably connected upper and lower parts. The upper part contains a downwardly directed helical air passage for centrifugal separation. The lower part is internally baffled for gravity separation. Air from the lower part is passed to an outlet through a plurality of filter units contained in the housing. The upper and lower parts are externally finned for increased cooling efficiency and further separation of liquid contaminants by condensation. (Author summary modified)

58453

APTIC NO. 82604

Frieburg, Norman

AN EVALUATION OF EMISSION INSPECTION PROCEDURES FOR HEAVY DUTY VEHICLES. Preprint, New York City Bureau of Motor Vehicle Pollution Control, Brooklyn, N. Y., Dept. of Air Resources, 27p., 1975. 12 refs. (Presented at the North American Motor Vehicle Emission Control Conference, Annual, 4th, Anaheim, Calif., Nov. 7, 1975.)

Several different emission inspection procedures were evaluated for their effectiveness in reducing carbon monoxide and hydrocarbon emissions from heavy duty vehicles. The study was based on 104 vehicle tests made since mid-1974. The 2500 RPM Unloaded Mode Test in combination with the Idle Mode Test was the most effective procedure for CO emission control. The Idle Mode Test alone was sufficient for hydrocarbons. A simple idle hydrocarbon test was found to be an effective test for catalyst activity in catalyst retrofit vehicles. The Loaded Steady-State (Key Mode) Test was not an effective test for CO except at failure rates approaching 30%. (Author abstract modified)

58454

APTIC NO. 81485

Frberg, Stig Erik and Lars Erik Gunnar Lundgren

FUEL COMPOSITION WITH INCREASED OCTANE NUMBER. (Svenska Utvecklingsaktiebolaget (SU), Stockholm (Sweden)) U. S. Pat. 3,902,869. 9p., Sept. 2, 1975. 3 refs. (Appl. Aug. 24, 1973, 1 claim).

A fuel composition with increased octane number was developed in which the combustion characteristics are regulated by the use of a microemulsion technique. Other fuel additives used for increasing the octane number also cause air pollution. The use of tetraethyl and tetramethyl lead is limited in many countries because the Pb additives remain in the exhaust from combustion engines in toxic forms. Other metal organic compounds are used such as dicyclopentadienyl compounds of iron, nickel, ruthenium, or osmium; organotitanium compounds, and oxygen containing organic copper compounds. These additives have a tendency to ignition by incandescence and are limited to elements which are soluble in the hydrocarbon mixture. The new composition consists of a main part of a liquid hydrocarbon mixture, water in the form of a microemulsion, and emulsifier which makes possible the solubilization of the water in the hydrocarbon mixture, and at least one water soluble inorganic substance which has been dissolved in the water solubilized in the hydrocarbon mixture. (Author abstract modified)

58455

APTIC NO. 83742

Fricke, Hans-Joachim

COAL-FIRED STEAM GENERATORS. (Kohlegefeuerte Dampferzeuger). Text in German. Elektrizitätswirtschaft, 74(25):907-912, 1975. 1 ref.

A review is presented of factors involved in design and operation of coal-fired boilers. These include location of coal storage and milling equipment, size of electrostatic precipitator needed, and choice of steel or concrete construction for boiler support. The electrostatic precipitation filter size is determined by a maximum gas velocity and by the fact that coal containing less than 0.8% sulfur requires a larger filtering installation because the gases have a lower electrical conductivity. Ash removal as a molten material is possible in some high capacity boilers.

58456

APTIC NO. 79247

Fu, Yuan C. and Eugene G. Illig

CATALYTIC COAL LIQUEFACTION USING SYNTHESIS GAS. Preprint, Bureau of Mines, Pittsburgh, Pa., Pittsburgh Energy Research Center, 11p., 1975 (?). 5 refs.

High-sulfur bituminous coal was liquefied and desulfurized by hydrotreating it with synthesis gas at a pressure of 3000 psi and a temperature of 425-450 °C in the presence of a cobalt molybdate-sodium carbonate catalyst, steam, and recycle oil. Both the sulfur content and the viscosity of the oil product decreased with the amount of hydrogen consumed whether synthesis gas or hydrogen was used as the reactant gas; however, less total hydrogen was required for the same oil product quality when synthesis gas was used. Coal conversions of from 85 to 92% and oil yields of from 40 to 60% were obtained with 5-60-minute reaction times for both synthesis gas and hydrogen runs. The sulfur content of the oil product ranged

from 0.21 to 0.41%. The addition of water during synthesis gas runs improved desulfurization and caused less hydrogen and more carbon dioxide to be consumed. The use of synthesis gas avoids costs associated with hydrogen production and allows for the off gas to be optionally burned as a low-Btu gas or utilized for methane production or methanol synthesis. (Author conclusions modified)

58457

APTIC NO. 83170

Fuehring, Heinrich and Johannes Helmut Sieber

METHOD OF AND APPARATUS FOR THE RECOVERY OF SOLVENT GASES FROM AN AIR STREAM. (Boewe Boehler and Weber Maschinenfabrik, Augsburg (Federal Republic of Germany)) U. S. Pat. 3,883,325. 5p., May 13, 1975. 3 refs. (Appl. March 21, 1973, 10 claims).

A method and apparatus for the recovery of solvent gases from an air stream are described. An air stream from a treatment vessel such as the drum of a drycleaning machine is passed through a cooler to reduce the condensable component level in the air stream before being introduced into an absorber in which solvent residues are removed. Between the cooler and the absorber, the air stream is reheated so that the relative humidity of the gas entering the absorber is well below 100%. The air stream is circulated through the cooler and the heater for a period sufficient to reduce the level of condensable components in the air stream to the point that the absorber is not immediately saturated. This process overcomes the problems in conventional solvent recovery systems which desorb the solvent from the adsorber by treating it with steam and frequently discharge a mixture of water vapor and solvent into the atmosphere, causing air pollution. (Author abstract modified)

58458

APTIC NO. 82873

Fujimoto, Kaoru, Noriko Horii, Tsutomu Shikada, Hiroo Tominaga, and Taisei Kunugi

AMMONIA REDUCTION OF NITROGEN OXIDES BY COPPER CATALYST (2). (Dokei shokubai ni yoru chisso sankabutsu no ammonia kangen (2)). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 32, 1975. (Presented at the Japan Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975, Paper 3D05.)

Reduction of nitrogen oxides by ammonia was studied on copper system catalysts (copper sulfate, copper nitrate), formed by precipitation procedures from sodium aluminate and copper salts. The weight composition ratio (copper oxide/aluminum oxide) for the catalysts was 1/5. Reactions were conducted under normal pressure, at a space velocity of 20,000/hr. A representative reaction mixture consisted of 300 ppm nitric oxide, 450 ppm ammonia, 100 ppm sulfur dioxide, 10% steam, 5% oxygen. At 250 °C and 280 °C, the copper sulfate system removed more NO (35%, 50%, respectively) than the copper nitrate system (15%, 20%), when steam concentrations ranged from 2-15%. The rate of NO removal became constant at steam concentrations over 2-5%. From 0-2%, there was a sharp decrease in the NO removal rate with increasing steam concentrations. At 350 °C, studies on catalyst reduction by ammonia showed that copper sulfate catalyst was more resistant to reduction by ammonia; oxidative decomposition of ammonia occurred with difficulty, possibly due to the presence of sulfate ions.

58459

APTIC NO. 82689

Fujio, Sadao, Toshio Sugimura, and Kenji Niizane

INDUSTRIAL WASTE DISPOSAL METHOD. (Kogyo haikibutsu no jogai hoho). Text in Japanese. (Asahi Denka Kogyo K.K. (Japan)) Japan. Pat. Sho 50-35503. 5p., Nov. 17, 1975. (Appl. Nov. 29, 1971, 1 claim).

A disposal method for exhaust gas containing chlorine and waste solutions containing effective chlorine is presented. These industrial wastes must be treated to prevent chlorine contamination. Conventionally an occluding solvent is used for

CONTROL METHODS

58465

the gas, and the urea method and pyrolysis method are used for the waste solutions, however, they are neither safe nor economical. In the new process the exhaust gas containing chlorine is treated with a solution containing alkali of 2-30% concentration, the best of which is a solution containing calcined soda 5-25% concentration. The waste solutions from the above process are decomposed by hydrocarbons in one or more processes at temperatures of 40-150 C. The required amount of hydrocarbons to be used for 100 weight volume of waste solution is calculated as follows: effective chlorine in waste solution(%) times 0.0846/carbon(%) in hydrocarbons. Also the alkali content in the waste solution must be adjusted to below 0.1 to 2% to achieve an optimum result from this method.

58460

APTIC NO. 82397

Fujisawa, Hideya and Norio Omori

ELECTRONICALLY CONTROLLED FUEL INJECTION SYSTEM. (Nippondenso Co., Ltd. (Japan)) U. S. Pat. 3,910,241. 9p., Oct. 7, 1975. 5 refs. (Appl. Aug. 5, 1974, 4 claims).

An electronically controlled fuel injection system is described which can control total air-fuel ratio to reduce harmful components in the exhaust gas more effectively. The system consists of two fuel supply systems connected with different groups of fuel injection valves. The fuel supply systems supply fuel at different pressures, allowing the engine to operate with a lean mixture. (Author abstract modified)

58461

APTIC NO. 83493

Fukui, Yukimasa, Teikichi Hosoi, and Toshiro Takahashi

MANUFACTURING METHOD FOR HIGH-QUALITY ACTIVATED CARBON USING ASPHALT AS A RAW MATERIAL. (Asufaruto o genryo to suru kohinshitsu kasseitan no seizohoho). Text in Japanese. (Daikyo Oil Co., Ltd. (Japan)) Japan. Pat. Sho 50-26515. 5p., Sept. 1, 1975. (Appl. Sept. 6, 1971, 1 claim).

A manufacturing method for high quality activated carbon using asphalt as the raw material is described. Asphalt is mixed with alkali metal hydroxides or alkali metal carbonates, and heated to 430-650 C. The coke obtained by this method is reactivated and refined to produce porous and highly adsorbent activated carbon. Conventional activated carbon made of wood is expensive and is in short supply, which contributes to a recent movement to use oil or coal as the new raw materials for activated carbons. This process also uses heavy hydrocarbons of petroleum as a raw material, and consists of a coking process in which 1/10 to 5 wt% of alkali metal hydroxides or alkali metal carbonates are added to asphalt, and a reactivating process in which water-washed coke will be refined and reactivated. The coking process of this method will contain only minimal sulfuric gas in the gas generated by the decomposition of asphalt, and contain 50-90 vol% of hydrogen. Also the sulfur content of the thermally decomposed light oil of the coking process is greatly lowered, which proves that this method is also effective as a desulfurization method.

58462

APTIC NO. 82871

Fukazawa, Hisashi and Yoshimi Ishihara

CATALYTIC REDUCTION OF NITROGEN OXIDES BY AMMONIA (2). ACTIVITY OF COPPER-BAUXITE CATALYST. (Ammonia ni yoru sanku chisso no sesshoku kangen (2). Do-bokisaito kei shokubai no kassei). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 30, 1975. (Presented at the Japan Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975, Paper 3D03.)

A mixture of gases (nitric oxide, ammonia, oxygen, sulfur dioxide, carbon dioxide, water vapor, and nitrogen) was passed through a catalyst bed, and reduction of nitrogen oxides to N₂ at a space velocity of 10,000/h was studied. A denitrification rate of 80-96% was attained with a copper-bauxite catalyst system, in the temperature range of 200-450 C.

About 95% denitrification occurred in gases containing 200-800 ppm SO₂ and 5-20% H₂O. The rate of denitrification was about 60% when no O₂ was present. The presence of 0.5% O₂ resulted in 96% denitrification. With an increase in CO₂ concentration, some decrease in catalyst activity was seen. On bauxite support, a vanadium catalyst system showed a 90-95% denitrification rate between 200-400 C; an iron catalyst between 200-350 C and a nickel catalyst between 200-420 C showed 70-86% denitrification.

58463

APTIC NO. 76422

Funamoto, K.

EMISSION GAS AND NOISE REGULATION COUNTER-MEASURES OF SMALL AND MEDIUM SIZE BOILER. (Chukogata boira no haigasu, soon boshi taisaku). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(10):31-38, 1975.

Recent trends in pollution control techniques for small and medium boilers are reviewed. Emission control measures by means of structural modification of boilers, modification of burner combustion techniques and modification of fan and noise control measures adopted for boilers manufactured by the Showa Tekko Co. are described with modification specifications and performance data. Data of nitrogen oxides and particulate concentrations were obtained, and the correlation between pollutant concentration and boiler efficiency was investigated. At present, the reduction of NO_x concentration to below 60 ppm is difficult, and the conversion to high quality fuels such as city gas and kerosene is considered to be the most effective control method.

58464

APTIC NO. 82969

Furlong, Donn B. and John C. Ovard

COOLING TOWER PLUME CONTROL. (Ecodyne Corp., Lincolnshire, Ill.) U. S. Pat. 3,899,553. 7p., Aug. 12, 1975. 6 refs. (Appl. June 27, 1973, 12 claims).

A cooling tower which alters the normal exhaust air temperature and moisture content so as to control or eliminate the fog plume escaping into the atmosphere is described. The tower has a standard wet evaporative cooling combined with a dry heat exchanger system. The dry section includes a plurality of vertically spaced heat exchange tubes positioned directly above the packing area of the wet section. The water flows through the tubes for preliminary cooling and then is directly distributed over the packing area of the wet section via nozzles associated with the lower ends of each tube. The heat exchanger tubes are spaced a greater distance apart than ordinarily found in a typical heat exchanger to achieve maximum heat transfer and minimum pressure drop. The tubes are supported from their lower ends and fixed in place at their upper ends by a rubber grommet received through the water basin floor. A finned tubular insert is removably received through the upper end of each tube for control of the water flow. The air flow to both the wet and dry sections are controlled by mechanically adjustable louvers or dampers. (Author abstract modified)

58465

APTIC NO. 83499

Furuhashi, Shoichi, Masaru Hiruma, and Yoshiteru Enomoto

AN AUTOMOBILE USING LIQUID HYDROGEN. PART 2. ENGINE. (Ekitai suiso jidosha. Dai 2 ho. Enjin). Text in Japanese. Preprint, Hydrogen Energy System Society of Japan, Tokyo, p. 39-42, 1975. (Presented at the Hydrogen Energy System Society of Japan Lecture Meeting, 2nd, Tokyo, Nov. 25, 1975.)

Various problems and countermeasures related to the design and assembly of an automobile engine which runs on liquid hydrogen and is especially made to participate in the SEED rally are discussed. A water-cooled single cylinder test engine manufactured by Mitsubishi Motor Co. with a total displacement of 500 cc is described. It is designed for efficiency of exhaust emission gas purification, reduction of fuel consumption,

and improvement of performance. Low temperature hydrogen (-10 C) was fed to the engine to test the effect on generation of power and nitrogen oxide (NOx) emission. Low-temperature hydrogen effectively increased power and reduced NOx emissions if an electromagnetic valve for prevention of a backfire was used to supply the hydrogen intermittently. With the above design, a test engine for the rally was produced: a remodeled, water-cooled 4-cycle piston type gasoline engine of Nissan Motors. This engine was modified into a hydrogen fueled engine and a hydrogen injection system was added. The compression ratio was increased from 8.3 to 9.3.

58466

APTIC NO. 83648

Furuhama, Shoichi

HYDROGEN ENGINE. (Suiso engine). Text in Japanese. Preprint, Fuel Society, Combustion Section, p. 74-83, 1975. (Presented at the Combustion Method of New Engines Seminar, Tokyo, Japan, June 9-10, 1975.)

Hydrogen engines for use in automobiles are discussed from various viewpoints. The most promising is the reciprocating spark ignition engine. The spontaneous combustion temperature is very high in the case of hydrogen. Therefore, high compression ratios are practicable, and operation with dilute H₂-air mixtures is possible. Combustion of dilute hydrogen is helpful for the improvement of heat efficiency and contributes to the suppression of nitrogen oxides formation. Hydrogen engines are especially suited for operation at low power output. However, the operation of hydrogen engines at high power output is accompanied by several shortcomings. Ignition often takes place too early, and back firing occurs. The formation of NOx also increases. Besides the reciprocating engine, diesel engines are being studied, although the results are still unsuccessful. The most important problem related to hydrogen engines is that of storing and transporting H₂. Three methods are possible: storage in high pressure tanks, transportation as hydrides of metals, or the use of liquid H₂. The use of tanks is not recommended, because the weight of the tank plus fuel is as much as 26 times that of gasoline in a tank for the same amount of thermal energy, and the volume is 26 times greater. Metal hydrides are also too heavy, although the volume is rather small.

58467

APTIC NO. 73326

Gaertner, Erwin

THE TECHNICAL DEVELOPMENT OF SOFT COAL MINING ON THE RHINE AS WELL AS OF SOFT COAL UTILIZATION. (Die technische Entwicklung des rheinischen Braunkohlenbergbaus sowie der Braunkohlenverwendung). Text in German. Glueckauf (Essen), 111(7):318-324, 1975.

After a review of the past development of soft coal mining in the area around Duesseldorf, Bonn, and Aachen and a description of future mining equipment, it is predicted that in the long run soft coal will be mainly used for coal gasification. For economically optimal soft coal gasification the process heat from high-temperature reactors will be used. There will be the option to conduct the gasification process either to produce synthetic natural gas or a mixture of carbon oxides and hydrogen for the metallurgical and chemical industries. Compared to conventional processes less carbon dioxide will be produced, and in comparison to the combustion of solid and liquid fuels the sulfur emissions will be avoided. A schematic illustration of the hydrogenating coal gasification process is given. A scaled experimental plant for hydrogenating gasification of soft and hard coal with a capacity of 100 kg carbon/hour is under construction and will be put into operation in the beginning of 1975. Apart from the gasification process using heat from high-temperature reactors, the conventional gasification processes will be further developed. Two processes are specifically mentioned and schematically illustrated; the high-temperature Winkler process yielding a low-sulfur gas and the tubular gasifier process for which moist soft coal as it comes from the mine can be used.

58468

APTIC NO. 82570

Gage, James R.

GLASS BAG FILTERS FOR LIME KILN EXHAUST. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 1 ref. (Presented at the Air Pollution Control Association Specialty Conference on the User and Fabric Filtration Equipment, Buffalo, N. Y., Oct. 5-7, 1975.)

Field experience with the use of fiberglass bag filters for the control of particulates in lime kiln exhaust is reviewed. A bag life of from 22-34 mo was achieved, with proper hopper inlet arrangement, hydraulic dampers, and reverse air draft control being partially responsible for efficient operation and long bag life. Dust emissions increased from 0.005 grains/dry standard cu ft at start-up to 0.014 grains/dry standard cu ft after 12 mo of service.

58469

APTIC NO. 83993

Gagnaux, G.

COMBATING ODORS WITH OZONE. (Geruchsbekämpfung mittels Ozon). Text in German. Wasserwirtsch., 65(12):336-337, 1975.

The VAR method for the destruction of malodorous substances in the air by ozone is described. This method, which is especially suitable for the treatment of malodorous emissions from wastewater treatment plants and in the food processing industry, used ozone which is absorbed in water. The waste air to be treated is contacted with the fine atomized droplets of the ozone-containing water in a reactor. The water is used in a closed cycle. At ozone consumptions ranging from 10 to 40 mg/cu m of waste air, the residual ozone concentration in the air is 0.01-0.02 ml cu m. The method has 100% efficiency for nitrogen bases and sulfur compounds, and 83% for total sulfur. Heavy hydrocarbons are destroyed, while lightweight hydrocarbons up to octane are not affected. Ozonization of waste air from wastewater treatment plants are also proved to be efficient in abating the germ count.

58470

APTIC NO. 82156

Galles, Henri Charles

VENTED FUEL TANK. (Regie Nationale des Usines Renault, Billancourt (France) and Automobiles Peugeot, Paris (France)) U. S. Pat. 3,915,184. 8p., Oct. 28, 1975. 1 ref. (Appl. May 2, 1974, 8 claims).

A system for preventing the escape of gasoline vapors from automobile fuel tanks is described. The system includes an expansion vessel and at least two conduits which are connected between the fuel tank and the expansion vessel. The end of one of the conduits opens into the expansion vessel at a higher level than does the second conduit through which the liquid gasoline returns. Several venting conduits are connected to the other end of the first conduit by means of a gravity responsive distribution valve. A non-return valve prevents fuel flow through the other conduit in the direction toward the expansion chamber.

58471

APTIC NO. 83639

Gallot, M. Jacques

ELECTRICALLY POWERED VEHICLES. STATE OF THE ART AND PERSPECTIVES. (Vehicules electriques. Situation actuelle et perspectives). Text in French. Ingrs. Automobile (Paris), no. 3-4:86-89, March-April, 1975.

The experimental use of electrical vehicles in urban centers has confirmed their reliability and their potential to alleviate nuisances, such as air and noise pollution. Actual public and private transportation of persons or merchandise is of equal quality to that which can be provided by thermally powered vehicles. However, even with combustion batteries, the electric vehicle will not be able to match actual performance of thermal motors; they are adapted to limited distance transport and to specific uses (30 km/hr, 30-40 km, 1-2 passengers with limited cargo). In urban and suburban centers, they then have

CONTROL METHODS

58477

many advantages and require no new technical modifications. Energy is only consumed when the vehicle is in motion, and the initial energy requirement is lower than for a thermal motor (about 8% economy). There are no flammable combustion reservoirs, and exhaust gases are compressed at ground level. They are also less noisy (10 dB reduction). By 1980-1990, electrical vehicles should be in use to the extent of improving living conditions as well as the national economy.

58472

APTIC NO. 82072

Garcea, Giampaolo

DEVICE FOR DETECTING THE OVERHEATING OF A CATALYST TRAVERSED BY THE EXHAUST GAS OF AN EXPLOSION ENGINE. (Alfa Romeo S.p.A., Milan (Italy)) U. S. Pat. 3,910,040. 11p., Oct. 7, 1975. 4 refs. (Appl. Feb. 26, 1974, 14 claims).

A device for detecting the overheating of a catalyst traversed by the exhaust gas of an explosion engine is described which has application in the automobile field. Determined chemical reactions are promoted between the components of the exhaust gas in catalysts above a certain temperature to reduce air pollutants. If the temperature of the catalyst exceeds determined values, the catalyst is damaged or destroyed. Overheating can occur when the gas upstream of the catalyst contains a too high percentage of components which react chemically in the catalyst, liberating a too high quantity of heat. It is difficult to obtain a sensor of sufficiently rapid response to avoid damaging or destroying the catalyst. This problem is resolved by avoiding the use of the temperature sensor and replacing it with a pressure sensor. It is responsive to variations of the pressure drop occurring in the exhaust gases upon passing through the catalyst mass, since these variations are a function of the temperature conditions existing in the catalytic mass. (Author abstract modified)

58473

APTIC NO. 83319

Gardner, Conrad O.

EXHAUST EMISSION CONTROL SYSTEMS AND DEVICES. (Assignee not given.) U. S. Pat. 3,889,464. 7p., June 17, 1975. 7 refs. (Appl. Dec. 20, 1973, 2 claims).

A catalytic converter structure in the exhaust passage of an internal combustion engine is described. The poisoned or contaminated catalyst bearing support member is replaced from an outer housing in the exhaust passage when the processed exhaust quality falls below required levels or mileage basis. Catalytic chamber converter structures and systems provide reaction device temperature control not dependent upon exhaust gas warmup of 1-3 min, thereby preventing emission of undesirable gas constituents during engine warmup. This is an improvement over prior art devices. (Author abstract modified)

58474

APTIC NO. 76624

Garrett, Ken

PORSCHE STRATIFIED CHARGE SYSTEM. *J. Automotive Eng.*, 6(4):6-9, Aug. 1975. 2 refs.

The exhaust emissions of the Porsche stratified charge system are described. The Porsche SKS engine is designed with a main and a small auxiliary combustion chamber, next to which is an even smaller chamber. If the injection of fuel into the auxiliary chamber is regulated to give minimum fuel consumption, the SKS engine runs on overall ratios as weak as 2.1 times stoichiometric. Quantitatively the nitrogen oxides content of the SKS engine exhaust is 90% lower than the highest values obtained with a conventional engine and still 60% of that of a conventional engine running on a very weak mixture. The carbon monoxide emission is about the same as that of a conventional engine on weak mixture, while the hydrocarbon output is lower. With another variant of the SKS engine, it is possible to reduce still further the hydrocarbon emissions, and at the same time, to lower the fuel consumption, but at the expense of increasing nitrogen oxides output.

58475

APTIC NO. 73488

Gast, Richard A.

PULSAIR - A METHOD FOR EXHAUST SYSTEM INDUCTION OF SECONDARY AIR FOR EMISSION CONTROL. Preprint, Society of Automotive Engineers, Warrendale, Pa., 16p., 1975. 10 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750172.)

A Pulsair system for the induction of secondary air into reciprocating engine exhaust ports for the oxidation of unburned hydrocarbons and carbon monoxide is described along with some preliminary laboratory results on four, six, and eight cylinder engines. The system utilizes the inherent exhaust system pressure pulsations to induce secondary air into the exhaust system. High-speed check valves are activated by subambient exhaust pressures which arise from reflected exhaust blowdown pressure waves. A single check valve set can be used to supply air to an entire exhaust manifold for multicylinder engines. The Pulsair system does not affect net engine power and is potentially less complex than typical air pump systems. Sufficient air can be induced to meet the expected secondary air requirements for many exhaust after-treatment systems. Some modifications to conventional exhaust systems may be necessary, however; Pulsair rates as high as 60% of the engine airflow can be achieved by modifying the exhaust crossover of a V-8 engine. (Author abstract modified)

58476

APTIC NO. 82011

Gau, Leonard P., Donald E. Riley, and Ivor W. Carter

ELECTRONIC SPARK TIMING ADVANCE AND EMISSION CONTROL SYSTEM. (Chrysler Corp., Highland Park, Mich.) U. S. Pat. 3,910,243. 16p., Oct. 7, 1975. 16 refs. (Appl. Jan. 9, 1975, 25 claims).

An electronic spark timing advance and emission control system for a pulsed electronic ignition control unit for an emission controlled internal combustion engine includes a distributor having a pair of speed responsive, signal generating pickups and a pair of electronic spark timing control channels, one excited by each pickup. One of the channels is operative only during engine starting intervals and triggers the electronic ignition control unit with pulses of fixed timing at the optimum starting angle of the engine in advance of its TDC position. The other channel is a variable timing control channel, which is operative after starting and during engine idle and run conditions, and provides ignition triggering pulses to provide any desired degree of spark timing advance or retardation during off-idle engine operating conditions in accordance with various engine operating parameters, including engine speed and manifold vacuum. Additional control over the engine timing for further reduction of vehicle exhaust emissions is provided in the form of an electronic time delay circuit, which is operative above a predetermined ambient temperature and for a predetermined time interval to delay the advance otherwise called for by the manifold vacuum advance signal during the transition from a vehicle load or acceleration condition to a no-load or vehicle cruising condition. (Author abstract)

58477

APTIC NO. 83206

Gayser, Gerhard

APPARATUS FOR THE CATALYTIC PURIFICATION OF EXHAUST GASES OF INTERNAL COMBUSTION ENGINES. (J. Eberspacher (Federal Republic of Germany)) U. S. Pat. 3,899,303. 5p., Aug. 12, 1975. 4 refs. (Appl. March 5, 1973, 5 claims).

An apparatus for the catalytic purification of exhaust gases of internal combustion engines is described. The device consists of a compact structural unit of relatively short length which nevertheless has a high reaction efficiency and operates with low counterpressure on the exhaust gases. The entire flow of the exhaust gases come into contact with the catalyst mass.

The device includes a housing with at least three separate chambers arranged one after the other and separated from each other by perforated and partition walls. The auxiliary air mixes with the exhaust gases and provides the necessary air for further oxidation of the gases which are deflected after they pass through the diverging section of the aspirating tube for flow backwardly through the catalytic mass and then subsequently to be discharged. The catalytic mass is preferably a granular material which may be replenished in the device through a top loading section having a separate cover for the addition of the catalyst material. In known devices the catalyst mass is renewable only by a major disassembly of the apparatus and by replacement of the catalyst mass. (Author summary modified)

58478

APTIC NO. 82383

Gazan, George A.

COMBINATION MUFFLER AND FILTER DEVICE.

(Assignee not given.) U. S. Pat. 3,898,063. 6p., Aug. 5, 1975. 14 refs. (Appl. Feb. 23, 1973, 15 claims).

A combination muffler and filter device for connection to hydraulic machines or combustion engines is described that can be easily adjusted to control the rate of flow therethrough. The unit is also automatically bypassed when it becomes clogged. The filter includes a container device formed by a pair of threaded telescopic tubular members that make up a chamber therein. The chamber contains one or more replaceable elements which are preferably made of porous sintered ceramic material. One of the tubular members is threaded for connection to the exhaust of an air cylinder, hydraulic motor, or combustion engine, and this member forms the inlet to the device. The replaceable element or cartridge is spring biased toward a seat surrounding the inlet. This tubular member also has an externally threaded portion with one or more outlet holes and connects the inside of the chamber adjacent to the filter cartridge to the exterior of the device. A second tubular member is internally threaded and is telescopically engageable over the externally threaded portion of the first member, adjustably closing off the outlet holes in the first member. The second member may either serve as a cap or closure or may have a bore therein connected to the chamber, serving as an alternative outlet for fluid from the chamber.

58479

APTIC NO. 76403

Gel perin, N. I., V. A. Liferenko, V. Z. Grishko, V. I. Sokolov, and A. T. Eremin

STUDY OF THE MASS TRANSFER CHARACTERISTICS OF A PILOT PLANT ABSORBER CONTAINING FLUIDIZED SPHERICAL PACKING IN THE PURIFICATION OF GASES FROM PHENOL. *Int. Chem. Eng.* 15(4):675-677, Oct. 1975. 5 refs.

The mass transfer characteristics of a pilot plant absorber containing fluidized spherical packing in the purification of gases from phenol were determined. The mass transfer capacity of the absorber was estimated by the number of transfer units in the gas phase S_g required for one section of the apparatus. The efficiency of a section increases with an increase in the gas and liquid flow rates, but is increased to a greater extent with an increase in packing layers. Data are presented on the mass transfer capacity of an individual section of the apparatus with no spherical packing on the grids. The efficiency of the is appreciably lower. The mass transfer capacity of the apparatus increases with a decrease in the support grid and an increase in polyethylene spheres. A mathematical relationship is derived which represents the experimental data satisfactorily, the divergence not exceeding $\pm 15\%$.

58480

APTIC NO. 82380

Genton, Richard G.

CONCENTRIC CLOTH-TUBE AIR FILTER AND DUST COLLECTOR. (Industrial Clean Air, Inc., Berkeley, Calif.) U. S. Pat. 3,898,067. 4p., Aug. 5, 1975. 6 refs. (Appl. Oct. 4, 1973, 5 claims).

AIR POLLUTION ABSTRACTS, JUNE 1976

A cloth tube air filter and dust collector for use in industrial baghouses is described which achieves an increased capacity of about 150% without an increase in the size of the baghouse. The air filter consists of two vertical cloth tubes that are coaxially arranged one within the other and are independently tensioned. The air to be cleaned is introduced into the annulus between the tubes and flows outwardly through the outer tube and inwardly through the inner tube. The dust is trapped in the annulus. The tubes can be cleaned by shaking or by reversing the air flow. (Author abstract modified)

58481

APTIC NO. 79689

Gentry, J. W. and K. R. Choudhary

COLLECTION EFFICIENCY AND PRESSURE DROP IN GRID FILTERS OF HIGH PACKING DENSITIES AT INTERMEDIATE REYNOLDS NUMBERS. *J. Aerosol Sci.* 6(5):277-290, 1975. 18 refs.

An experimental investigation of the behavior of fiber filters was studied using reproducible model filters consisting of successive layers of filter elements. These filter elements were built from grids of stainless steel wire cloth to simulate a fiber filter. A dust and smoke photometer was used to measure the particle collection efficiency of the model filters. The wires were 25 to 60 micron in diameter and had an interwire distance of 35 to 80 micron. The packing density ranged from 0.20 to 0.25. The measurements of collection efficiency and the pressure drop across the filter were taken for linear velocities of from 50 to 300 cm/sec corresponding to Reynolds numbers of 1 to 10. Four thicknesses of filters ranging from 0.04 to 0.17 cm were used. The experimental data were consistent with Darcy's law and a first order particle collection mechanism. A slight departure for the pressure drop measurements was observed at the highest flow rates. The efficiency measurements using monodisperse latex particles of 0.234, 0.50, and 2.02 micron diameter indicated a first order removal process. (Author abstract modified)

58482

APTIC NO. 80453

George, Zacharia M.

HYDRODESULFURIZATION OF COKE FROM ATHABASCA TAR SANDS OPERATION. *Ind. Eng. Chem. Prod. Res. Develop.* 14(4):298-303, Dec. 1975. 14 refs.

The relatively high sulfur content of the coke produced at the Athabasca tar sands operation makes it environmentally unsuitable as a boiler fuel. Hydrodesulfurization of the coke at 850 C in a fixed bed flow reactor indicated that 70% desulfurization can be achieved with small particle size and gas hydrogen flow rate. Some evidence showed that hydrogen sulfide inhibits desulfurization. The partial pressure of hydrogen significantly influenced the desulfurization. (Author abstract)

58483

APTIC NO. 83234

Gerasimov, D. A., I. P. Dobrovol'skiy, B. S. Strogal'shchikov, and T. I. Babashkina

SELECTION OF OPTIMAL OPERATIONS OF DUST SEPARATORS WITH SLOTTED CONTACT MEMBERS. (Vybor optimal'nykh rezhimov raboty pyleulavlivayushchikh apparatov s shchelevymi kontaktnymi elementami). Text in Russian. *Lakokrosochn. Mater. Ikh Primenen.*, vol. 5:70-72, 1975. 8 refs.

The effect of work procedures with slotted contact devices on the efficiency of dust removal was studied, and the selection of optimal parameters for their use in cleaning gases of non-toxic dust from pigment production was investigated under laboratory conditions. Dust collection efficiency grows with an increase in the specific discharge of fluid (water). The content of dust remaining in the cleaned air decreased with its discharge through the contact element; the degree of cleaning increased and reached 97.2%. The relationships obtained from the experiment permit a quantity of contact elements and a work regimen to be selected that ensures the fulfillment of sanitary requirements.

58484

APTIC NO. 84159

Gerken, A.

ENERGY CONSERVATION MEASURES IN THE PAPER AND PULP INDUSTRY.

(Energieeinsparungsmassnahmen im Bereich der Papier- und Zellstoff-Industrie). Text in German. VDI (Ver. Deut. Ing.) Ber., no. 250:93-102, 1975. 7 refs.

Energy-saving measures in the paper and cellulose-producing industries are described. Steam, hot air, and electric power for which heating oil, natural gas, and coal are used are pollution sources. Spent liquor evaporation and combustion became attractive after crude oil prices shot up in 1974. In order to realize this economizing potential, thin liquor concentrations had to be augmented, spent liquor recovery improved, and liquor evaporation installations expanded. Other measures to be taken involved raising the dew point in the dryer section and extended heat-recovery devices in paper-making machinery, predominantly in multi-cylinder engines. About 80% of the process heat in the industries is presently made available by means of heat-electric coupling, and this is expected to reach 90% eventually. Increased unit yields of steam generator installations, introduction of combined gas-steam generator processes with higher energy utilization levels, and reduced condensation-power generation are 3 possibilities for improved energy transformation.

58485

APTIC NO. 83963

Germerdonk, Rolf

EXPERIMENTS WITH FLUE GAS DESULFURIZATION BY A WET CLAUSS PROCESS.

(Versuche zur Entschwefelung von Abgasen mit einem nassen Claus-Verfahren). Text in German. Chem. Ing. Tech., 47(21):897, 1975.

New wet type Claus process for the desulfurization of fluctuating quantities of residual and waste gases containing variable concentrations of hydrogen sulfide and other sulfur compounds is described. The reaction between H₂S, sulfur dioxide and water (reaction II according to Claus process) takes place in an aqueous buffered glutaric acid solution. The excess H₂S as well as any other noxious components are then incinerated in an incinerator chamber, and after the water formed during the reaction is condensed, the SO₂-containing flue gases are recirculated to the absorber. The residual flue gas passes through a final absorber stage in which SO₂ is washed out by the reaction solution. It was possible to reach residual SO₂ concentrations of 200-2000 mg/cu m in laboratory experiments. Further investigations are being conducted on a pilot plant.

58486

APTIC NO. 76111

Gerstle, Richard W. and Gerald A. Isaacs

SURVEY OF FLUE GAS DESULFURIZATION SYSTEMS. REID GARDNER STATION, NEVADA POWER CO. (FINAL REPORT). PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1321, Program Element 1AB013, ROAP 21ACX-130, Task 6j, Rept. EPA-650/2-75-057-j, 43p., Oct. 1975.

NTIS: PB 246852/AS

Field evaluations of two flue gas desulfurization systems designed to control sulfur dioxide and particulate emissions from two existing 125-megawatt generating units at Nevada Power Company's Reid Gardner Station were performed. The systems utilized sodium carbonate scrubbing with twin parallel venturis followed by an absorber tower. Neither system met SO₂ and particulate guarantees during their first year of operation. The particulate removal efficiency (scrubber and multicyclone) was over 99%, while that for SO₂ was slightly over 90%. The potential availabilities of the systems seemed to be near 100%, with one system operating for 3814 hr and the other for 2947 hr. (Author abstract modified)

58487

APTIC NO. 82367

Giammarco, Giuseppe and Paolo Giammarco

PROCESS FOR THE REMOVAL OF CARBON DIOXIDE AND/OR HYDROGEN SULPHIDE AND OTHER ACIDIC GASES FROM GAS MIXTURES. (Vetrocoke Cokapuania S.p.A., Venezia Porto Marghera (Italy)) U. S. Pat. 3,897,227. 13p., July 29, 1975. 1 ref. (Appl. April 26, 1973, 5 claims).

A process for the removal of carbon dioxide and/or hydrogen sulfide and other acidic gases from gas mixtures is described which provides a simpler and more economical means for regenerating the absorbent than prior art methods. The gas mixture to be purified is brought into contact with an absorption solution, and the gases absorbed in the absorption solution are removed by heating the solution. A combustible substance is burnt in direct contact with the absorption solution to be regenerated, and the combustion gases are mixed with the water vapor produced by the heat of combustion. This gas mixture is then brought into contact with the absorption solution to be regenerated.

58488

APTIC NO. 83406

Giavarini, Carlo

DEHYDROGENATION OF HEAVY PETROLEUM FRACTIONS WITH SULFUR. (Deidrogenazione con zolfo di frazioni petrolifere pesanti). Text in Italian. Rass. Chim., 27(4):169-171, July-Aug. 1975. 7 refs.

At temperatures over 170 C, sulfur begins to react effectively with various oil residues and with products precipitated with propane; at such temperatures, a significant quantity of hydrogen sulfide develops. The maximum intensity of the reaction is reached at approximately 250 C. At temperatures under 160-170 C, there are no thermal effects. There is only a decrease in viscosity (measured at 210 C) of about 10%, proportional to the quantity of sulfur added. This is due to the dispersed sulfur rather than to additional compounds formed by the combination of sulfur and hydrocarbons.

58489

APTIC NO. 82069

Gibson, Ira J.

TURBO-SUPERCHARGER EXHAUST. (Clark Equipment Co., Buchanan, Mich.) U. S. Pat. 3,910,041. 4p., Oct. 7, 1975. 12 refs. (Appl. May 6, 1974, 2 claims).

A stress-free exhaust construction for a turbosupercharger on an engine is described having an adjacent wall through which exhaust gases are discharged. A rigid conduit member is connected to and extends away from the supercharger. A second rigid conduit member in alignment with the first conduit extends through the wall. There are cooperating baffles at the adjacent ends of the two conduit members which provide a non-rigid connection between the two conduit members. One of the baffles forms a reservoir which contains a liquid, forming a seal which prevents the escape of exhaust gases. In other installations a slip joint type connection is used which is inefficient because a considerable amount of exhaust gas may be discharged through the connection instead of out through the end of the exhaust pipe outside of the enclosure. (Author abstract modified)

58490

APTIC NO. 84288

Gilbert, Traugott

RESULTS OF A STUDY TRIP TO OFF GAS DESULFURIZATION PLANTS IN THE U. S. AND JAPAN SEPT. 14 TO OCT. 8, 1974. (Ergebnisse einer Studienreise zu Abgasentschwefelungsanlagen in USA und Japan 14.9. bis 8.10. 1974). Text in German. TUE (Tech. Ueberwach.), 16(11):317-328, Nov. 1975.

Flue-gas desulfurization installations in 10 fossil fuel operated power stations in the U. S. and Japan are discussed. Four of the U. S. power plants worked on the wet-scrubbing principle, 1 with cathodic oxidation. The rate of efficiency ranged from

50-96.8% sulfur dioxide reduction. The installations were American-built and at their test or demonstration stages. Four Japanese stations used heating oil by itself or mixed with coal and used wet scrubbing with sodium sulfate, calcium carbonate, or calcium hydroxide SO₂-adsorption to activated coal, or the Chiyoda Thoroughbred 101 Process. The degree of efficiency was very high, from about 80-94%. Stack gas desulfurization installations in coal-operated power stations with an output of up to 115 megawatt and a waste gas flow of 400,000 cu m/hr, and for oil-operated stations up to 220 megawatt and a flue-gas flow of 600,000 cu m/hr conformed to the established technical status in West Germany. Higher waste gas quantities could be treated by several parallel installations. Higher performance changes with increased loads lasting for hours could be controlled by adding or turning off washer units. Rapid fluctuations were regulated by bypass. In coal-powered stations, dust separation of the waste gas prior to desulfurization was the basis for a smooth desulfurization process.

58491

APTIC NO. 83099

Girodin, Mario

COMBUSTION ENGINE WITH REDUCED EMISSIONS. (Assignee not given.) U. S. Pat. 3,877,220. 8p., April 15, 1975. 6 refs. (Appl. March 9, 1973, 9 claims).

An external combustion engine suitable for use in automobiles is described in which air compressed in a plurality of cylinders is delivered to a common combustion chamber. The hot exhaust gases exiting the combustion chamber are returned directly to the cylinders at a pressure which approximates the compressed air delivery pressure. The combustion chamber is divided into portions and control over the engine output power is achieved either by varying the time of opening of the valves which return the exhaust gases to the cylinders or by means of a variable pressure drop fuel delivery device which operates in combination with a variable delivery fuel pump. Previous proposed external combustion engines are not applicable for use in the automotive field. (Author abstract modified)

58492

APTIC NO. 84167

Glebov, V. P., G. I. Motin, F. M. Yakhilevich, and I. A. Fedyunin

THE FORMATION OF NITROGEN OXIDES IN COMBUSTION PRODUCTS IN CYCLONE TYPE FUEL OIL BURNERS. (Obrazovaniye oksidov azota v produktakh sgoraniya pri ziklonnom szhiganiy mazuta). Text in Russian. *Teploenergetika*, no. 4:9-12, April 1975. 11 refs.

It was demonstrated that 300 Mw units with cyclone-burning of high sulfur content fuel oil in gas and oil fuel combination cyclone-type steam generators enhance the reliability of the steam-generator. Nitrogen oxide concentrations in the combustion products are only 10% higher compared to burner-type fuel-oil combustion. The maximum allowable NO_x content in the combustion chamber discharge of a 2000-3000 Mw power plant does not exceed 0.3 g/cu m. A variety of techniques are used to cut down NO_x discharge from steam generators. Studies were conducted of NO_x formation in the high temperature zone of a PK-41 Ts steam generator with two vertical cyclone-type prechambers. It is concluded that a decrease in the volume of auxiliary air and a change in the air velocity at the burner outlet in the 35-100 m/sec range may substantially reduce NO_x concentrations. Estimates indicate that use of 10-15% recycled gases in cyclone-type prechambers will substantially reduce NO_x discharge with no adverse effect on the performance of the burner.

58493

APTIC NO. 82896

Glucksman, Dov Z.

ELECTRIC PARTICLE PRECIPITATOR. (Appliance Development Corp., Boston, Mass.) U. S. Pat. 3,877,897. 11p., April 15, 1975. 6 refs. (Appl. Dec. 5, 1972, 15 claims).

AIR POLLUTION ABSTRACTS, JUNE 1976

An electric particle precipitator is described which includes a stack of rotatable plates wherein metal plates alternate with plates of an electric insulating material having conductive overlays. Intense electrostatic fields are established between the metal plates and the conductive overlays. Juxtaposed surfaces of the metal plates and of the overlays are scrubbed by fixed brushes or fixed brushlike devices. This precludes undue accumulation of particles and eliminates the chore of manual cleaning. The surfaces of the plates in the process of being cleaned are automatically grounded. This device overcomes the disadvantages of conventional electrostatic particle precipitators. These include generation of gases detrimental to the health of human beings such as ozone and compounds of nitrogen; the need to provide additional ionizing means for ionizing the streams of air and other gases from which particulate matter is removed; the danger of electric leakage or breakdown due to the presence of high field concentrations; and the need to frequently clean the particle collecting electrodes. (Author abstract modified)

58494

APTIC NO. 76061

Gogineni, M. Rao, K. Malki, and D. C. Borio

OPTIMIZATION OF A LIME/LIMESTONE WET SCRUBBING PROCESS FOR SO₂ AND PARTICULATE REMOVAL IN A MARBLE BED SCRUBBER (FINAL REPORT). Combustion Engineering Inc., Windsor, Conn., Environmental Protection Agency Contract 68-02-0221, Program Element 1A013, ROAP 21ACY-020, Rept. EPA-650/2-75-052, 243p., June 1975.

NTIS: PB 246114/AS

Results from tests of a prototype marble bed scrubber system are presented. A total of 16 once-through soluble system tests with sodium carbonate as the scrubbing solution indicated that the scrubber is a very good liquid/gas contacting device for sulfur dioxide removal from flue gas with an overall efficiency of 90-95%. The liquid/gas ratio and scrubber liquid composition significantly affected SO₂ removal; other variables exerted little or no effect. The results of six limestone furnace injection system tests using a boiler calcined limestone and fly ash mixture indicated that the solids concentration in the spray slurry and the liquid/gas ratio significantly affects SO₂ removal. A run of six limestone tail-end system tests using commercial limestone in a dual marble bed scrubber revealed that the SO₂ removal efficiencies of the lower and upper beds are the same based on the SO₂ concentrations entering the respective beds. Scale-free operation of both the furnace injection and tail-end systems was achieved in a closed loop system without employing liquid blowdown by maintaining 8-10% solids in the spray slurry. (Author abstract modified)

58495

APTIC NO. 82671

Goldschmidt, Klaus and Gerhard Hausberg

DEVICE FOR SEPARATING SO₂ AND DUST FROM FLUE GASES. (Steag Aktiengesellschaft, Essen and Gottfried Disschoff Bau Kompl. Gasreinigungs (Federal Republic of Germany)) U. S. Pat. 3,880,597. 4p., April 29, 1975. 10 refs. (Appl. Oct. 12, 1972, 2 claims).

A new and useful spray tower for separating sulfur dioxide and dust from flue gases is described. It consists of an upper inlet tube extending into a vertically elongated tower space and defining an intake sleeve. A bank of wash water injecting nozzles are arranged vertically in the tower axis. Additional nozzles produce a wash water screen around the inflow and surrounding the intake sleeve. There is advice for injection of additives located on the upstream side and for introducing lime dust or a lime/water suspension into the contaminated gas. In a known device of this type, the flue gases are supplied at the bottom of the spray tower and the clean gas is evacuated at the top. A lime/water suspension is injected in the gas stream, together with wash water, through swirl nozzles arranged in the central axis one above the other. Because gas and water are conducted in countercurrent, the resulting contact times are relatively short. Undesirable accretions, composed partly

CONTROL METHODS

58501

of lime dust and partly of impurities conveyed by the fumes, are deposited in the tower around the regions where the additive is injected.

58496

APTIC NO. 75977

Gooch, John P., Jack R. McDonald, and Sabert Oglesby, Jr.

A MATHEMATICAL MODEL OF ELECTROSTATIC PRECIPITATION (FINAL REPORT). *Southern Research Inst., Birmingham, Ala., Environmental Protection Agency Contract 68-02-0265, Program Element 1AB012, ROAP 21ADJ-026, Rept. EPA-650/2-75-037, SORI-EAS-75-171, 2887-XXVI, 162p., April 1975. 42 refs.*

NTIS: PB 246188/AS

A mathematical model which relates collection efficiency to electrostatic precipitator size and operating parameters is presented. Procedures are outlined for calculating particle charging rates, electric field as a function of position in wire-plate geometry, and the theoretically expected collection efficiencies for various particles sizes and precipitator operating conditions. Methods for empirically representing collection efficiency losses caused by non-uniform gas velocity distributions, gas bypassing the electrified regions, and particle reentrainment due to rapping of the collection electrodes are proposed. The incorporation of these proposed techniques into a mathematical model of electrostatic precipitator performance results in a reduced theoretical overall collection efficiency. Theoretically calculated collection efficiencies are compared with efficiencies obtained from measurements on precipitators serving coal-fired generating stations. The effects of changes in particle size distribution on calculated collection efficiencies obtained from the model are also discussed. A procedure for estimating the program output by hand calculation is given in addition to a complete listing of the FORTRAN computer program. (Author abstract modified)

58497

APTIC NO. 82329

Goransson, Rolf

ARRANGEMENT FOR SUSPENDING AND CONTROLLING PRECIPITATION ELECTRODES. (*Aktiebolaget Svenska Flaktfabriken, Nacka (Sweden)*) U. S. Pat. 3,892,545. 5p., July 1, 1975. 2 refs. (Appl. Sept. 13, 1974, 5 claims).

A novel and improvement arrangement for suspending and controlling substantially flat precipitation electrodes of great length and width mounted in parallel rows in an electrostatic precipitator is described. Other arrangements require mechanical auxiliary equipment and additional space. This arrangement consists of a supporting beam bent to form a G-shaped groove which supports the precipitation electrodes by means of suspension irons secured on the electrodes by welding or riveting. The supporting beam in its bottom is provided with a slot corresponding to the cross section of the suspension iron, through which slot the suspension iron is threaded when the precipitation electrode is suspended. The suspension iron has a short pin at the upper end which carries the precipitation electrode after the mounting and is held in place after the suspending operation by the two parallel walls of the G-shaped groove.

58498

APTIC NO. 82320

Gordon, Carroll G. and Raymond C. Graham

INTERNAL COMBUSTION ENGINE. (*Edwin Melville Edwards, Menlo Park, Calif.*) U. S. Pat. 3,897,767. 6p., Aug. 5, 1975. 3 refs. (Appl. Oct. 1, 1973, 5 claims).

A new and improved internal combustion engine ignition system is described which reduces undesirable engine emissions. Other electronic or transistorized ignition systems are not effective in producing a desired degree of improvement in internal combustion engine performance. This system uses an ignition system with a transformer having first and second primary windings. A secondary winding is connected in series with a conventional spark gap such as a distributor and a plurality of spark plugs. The initial primary winding is connected

between an oscillator and one terminal of a power supply to form a part of the oscillator. The oscillator is connected between the terminals of the power supply. The auxiliary primary winding is connected across the terminals of the power supply in series with a switch such as conventional ignition points operated in accordance with engine speed. The two primary windings are positioned adjacent to one another so as to be inductively coupled. The oscillator used continuously operates both at an amplitude and at a frequency which vary depending upon whether or not the switch is open or closed. (Author abstract modified)

58499

APTIC NO. 83271

Gorman, Paul G.

REMOVAL OF PARTICULATE MATTER WITH SUPER-SONIC DROPLETS. (*Midwest Research Inst., Kansas City, Mo.*) U. S. Pat. 3,894,851. 4p., July 15, 1975. 10 refs. (Appl. Feb. 7, 1972, 7 claims).

A method to remove particulate matter from a gas stream in which the matter is entrained is described. The stream flows through a duct at a relatively low velocity. The outlet of a converging diverging nozzle communicates with the duct at a mixing region. Steam under pressure at subsonic velocity is supplied to the inlet of the nozzle. The steam reaches sonic velocity in the throat of the nozzle, is accelerated to supersonic velocity in the diverging section of the nozzle, and undergoes isentropic expansion to cause partial condensation, resulting in the formation of droplets of an 0.1 micron size. The droplets are injected into the duct and combined with the contaminants to increase the size of particles carried by the gas stream downstream from the mixing region. A cyclone separator is located downstream to separate the particles of increased size from the gas stream. Unlike other systems, the velocity difference between the gas stream and the water droplets is not limited to the sonic range and quantities of droplets of submicron size are produced. (Author abstract modified)

58500

APTIC NO. 82131

Goto, Kenji, Norio Shibata, and Ryoza Mitsui

CONTROL APPARATUS FOR ENGINE EXHAUST GAS PURIFICATION SYSTEM. (*Toyota Jidosha Kogyo Kabushiki Kaisha, Toyota (Japan)*) U. S. Pat. 3,911,674. 6p., Oct. 14, 1975. 8 refs. (Appl. Jan. 15, 1974, 8 claims).

A control apparatus for internal combustion engine exhaust gas purification systems that include any combination of an exhaust gas recirculation system, an exhaust gas oxidation reactor (catalytic converter), a thermal reactor, and a secondary air system is described. The apparatus is simpler in design than prior art systems and produces pneumatic signals for selectively actuating control valves of the exhaust purification system. The control system includes the following: devices for detecting engine operating conditions in terms of engine coolant temperature, ambient temperature, internal temperature of the exhaust gas oxidation reactor, and vehicle speed; a selective actuating mechanism which includes a change-over valve, a one-way valve, an orifice, and a passage for logically processing the pneumatic signals of the detecting devices; a change-over valve disposed midway in the exhaust pipe for controlling the exhaust gas flow between the oxidation reactor and a bypass passage; and a change-over valve for supplying secondary air to the oxidation reactor. (Author abstract modified)

58501

APTIC NO. 82496

Goto, Kenji and Norikatsu Ishikawa

EXHAUST GAS CLEANING SYSTEM FOR INTERNAL COMBUSTION ENGINES. (*Toyota Jidosha Kogyo Kabushiki Kaisha, Toyota-shi (Japan)*) U. S. Pat. 3,890,945. 8p., June 24, 1975. 11 refs. (Appl. Jan. 31, 1974, 13 claims).

An exhaust gas recirculation system for controlling nitrogen oxide emissions from internal combustion engines is described which offers improved mixing of the recirculated exhaust gases with the air-fuel mixture. The system includes a cylindrical chamber interposed between a carburetor and an intake pipe of the engine, and exhaust gas recirculation conduit communicating between the exhaust pipe of the engine and the cylindrical chamber, and a mixture conduit communicating between the carburetor and the cylindrical chamber. The outlet of the mixture conduit is tangentially connected to the cylindrical chamber so that a swirling flow is established to promote mixing between the air-fuel mixture from the carburetor and the recirculated exhaust gas. The exhaust gas recirculation conduit may also have its outlet tangentially connected to the cylindrical chamber. The exhaust gas cleaning system may also include a second carburetor for producing an air-fuel mixture ratio richer than the air-fuel mixture which is to be mixed with the recirculated exhaust gases as well as a second intake pipe communicating between the second carburetor and the combustion chamber of the engine in the vicinity of a spark plug. (Author abstract modified)

58502

APTIC NO. 83795

Grabovich, V. A., V. I. Petrov, A. A. Sapozhnikov, and E. K. Yakushin

INCREASING THE EFFICIENCY OF GAS CLEANING FACILITIES AT THE VINNITSAENERGO ELECTRIC POWER PLANTS. (Povyshenie effektivnosti ispol'zovaniya gazoochistnykh sooruzheniy teplovykh elektrostansiy Vinnitsaenergo). Text in Russian. *Energ. Elektrif.*, no. 2:37-38, 1975.

Mistakes in connection with the design and erection of the electrostatic precipitators EG3-3-177 which were installed at the Ladhinskaya electric power station in 1972 were corrected in the design of the gas cleaning facilities at the Vinnitsaenergo power plants. Tests showed that electric separators EG3-3-177 have a high degree of efficiency (98-98.7%). With further improvements of the corona electrodes, the efficiency increased to 99.1%. Still, the utilization factor was low at certain units (50-60%). However, it was increased to 80-100% through the cleaning of ash bins and through various improvements inside of the electric separators. It is hoped that even better results will be obtained once the RUF-2M relay system is introduced in all units. Ventilation was introduced to compensate for design shortcomings, especially during repair and service time.

58503

APTIC NO. 81752

Green, Raymond J.

INTERNAL COMBUSTION ROTARY ENGINE OXIDIZING FLUID INJECTION ARRANGEMENT. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,913,535. 6p., Oct. 21, 1975. 3 refs. (Appl. Aug. 17, 1973, 3 claims).

An oxidizing fluid injection arrangement for rotary combustion engines that is designed to promote the burning of partially burned and unburned compounds in the exhaust is described that provides air injection in the engine's internal exhaust passage immediately downstream of the exhaust port without the injection arrangement experiencing the full heat of the exhaust gas. The injection arrangement includes a nozzle that is mounted on the engine's exhaust manifold and locates in a recess of the exhaust passage wall in the engine's rotor housing out of the path of the exhaust gas. The recess in the exhaust passage possesses a curved section that deflects oxidizing fluid (air) from the nozzle into the exhaust gas in a direction transverse thereto. (Author abstract modified)

58504

APTIC NO. 84262

Griesche, Guenter

EXTINCTION OF SOFT COAL DUST FLAMES IN DUST DUCTS OF DUST REMOVAL SYSTEMS BY FIRE LOCKS. (Loeschung von Braunkohlenstaubflammen in Entstaubungsleitungen mit Flammensperren). Text in German. *Neue Bergbautech.*, 5(9): 720-725, 1975. 2 refs.

In an experimental setup, the extinguishing effect of flame arresters on soft-coal flames was studied under conditions occurring in dust-collecting installations upon further use of the exhaust from the dust separator. The experimental installation permitted the generation of soft-coal dust flames under conditions found in dust separator installations. Flow rates were attained of up to 25 m/sec in the testing tube (diameter: 150 mm). Each experiment was repeated 10 times under identical conditions. In the experimental series, with flame arresters, the dust concentration of the mixture varied from 100-380 g/cu m i.N. for each flame arrester. Soft-coal dust of a mean grain size of 0.042 mm was used with an ash content of 7.2%. Proximate analysis showed 46.8% volatile components and 37.1% fixed carbon. The results indicated that extinction of soft-coal dust flames was most difficult in the flame arresters if the mixed flow in their ducts approximated the laminar range of flow. This limit for flame arresters was expected to be reached at rh equals 1.448 mm and a flame speed of about 50-40 m/sec. The correlation of experimental results with the theoretically derived relationships indicated the dimensions of the flame arrester to be used in practice. It was recommended further that the dimensions be rh equals 1.45 mm and a lamellar package length of 550 mm.

58505

APTIC NO. 82493

Grisell, Charles P.

ELECTROSTATIC PRECIPITATOR. (Rust Engineering Co., Birmingham, Ala.) U. S. Pat. 3,892,546. 6p., July 1, 1975. 5 refs. (Appl. May 31, 1974, 10 claims).

An improved electrostatic precipitator is described which is more efficient and versatile than other precipitators. The gas flow passage converges in height and diverges in width from inlet to outlet. It is of constant cross sectional area throughout its entire length. The aspect ratio is constant for one direction of gas flow. The precipitator is divided by discharge electrodes into a number of gas flow sub-passages. Each sub-passage is of constant cross sectional area and constant aspect ratio. (Author abstract modified)

58506

APTIC NO. 83358

Grosche, Michael and Guenther Woelk

STUDIES OF A BURNER WITH VORTEX-FREE RECIRCULATION FLOW. (Untersuchung an einem Brenner mit drallfreier Rezirkulationsstroemung). Text in German. *Chem.-Ing.-Tech.*, 47(2):69, 1975. (The full-length text can be obtained from: Verlag Chemie GmbH, Weinheim, Postfach 1260, West Germany).

A burner with vortex-free inner recirculation flow, which is capable of burning gaseous and liquid fuels efficiently and with low noise and air pollution, is described. The vortex free inner recirculation flow of the hot combustion product generates thorough combustion and a stable flame. The recirculation flow can be reached through a suitable radial impulse flow of the combustion components through the burner. The burner inlet diameter, annular area, and the angle of deflection control the combustion performance. The full-length article describes the burner details and its efficient performance characteristics with natural gas and light heating oil and also gives its advantages compared to a vortex burner.

58507

APTIC NO. 83904

Grosche, M. and G. Woelk

INVESTIGATION OF A BURNER WITH NONTWISTING RECIRCULATING FLOW. (Untersuchung an einem Brenner mit drallfreier Rezirkulationsstroemung). Text in German. *VDI (Ver. Deut. Ingr.) Ber.*, no. 232:221-226, 1975.

Carbon monoxide, nitric oxide and soot emissions of nontwisting recirculating burners for gas and extra light fuel oil were studied. Gas is admitted radially into the combustion chamber, while air is admitted axially. The NO and CO emissions are determined by the recirculation of the combustion gases,

CONTROL METHODS

58513

which is influenced by the angle of deflection and the free flow crosssection of the air stream. In oil burners, oil is gasified before it is mixed with the combustion air. Here, the NO emission is independent of the CO emission because the CO concentrations remain practically constant despite decreasing NO concentrations at air-excess coefficients over 1. Very low NO and CO emissions were achieved in both natural gas and oil burners. Soot-free combustion of extra light fuel oil was observed.

58508

APTIC NO. 83568

Grosseau, Albert

RECOVERY OF THERMAL ENERGY FROM THE EXHAUST GASES OF AN INTERNAL COMBUSTION ENGINE. (Societe Anonyme Automobiles Citroen, Paris (France)) U. S. Pat. 3,884,194. 4p., May 20, 1975. 6 refs. (Appl. Dec. 17, 1973, 7 claims).

A steam generator is described which consists of an exhaust pipe connected to receive exhaust gases from an internal combustion engine. A duct, containing water to be heated, is located within the exhaust pipe in heat exchange relationship with the exhaust gases. The exhaust pipe and the duct are each formed from two half shells having flanges along each edge portion. The half shells of the exhaust pipe and the duct are connected at common positions. (Author abstract modified)

58509

APTIC NO. 76365

Groth, R. H., N. T. Campbell, and D. S. Calabro

NOX EMISSIONS FROM STEAM BOILERS: EFFECT OF ADDED ANILINE, THIOPHENE, AND TOLUENE. *J. Eng. Power*, 99(4):655-656, Oct. 1975.

The effects of additives on nitrogen oxide emissions from steam boilers were investigated. Fuels used in the operation of industrial boilers vary with respect to nitrogen content, sulfur content, hydrogen to carbon mole ratio, and physical characteristics. The effect of these variables on the NOx emission rate of a marine type boiler used for an industrial application was studied by adding aniline, thiophene, or toluene to the fuel. About 50% of the nitrogen in the added aniline is converted to NOx. The thiophene has no effect on the NOx emission level. The toluene raises the NOx emission level by a small amount.

58510

APTIC NO. 84162

Gruden, Dusan and Karlheinz Lange

THE PORSCHE-SKS-ENGINE: MIXTURE FORMATION, COMBUSTION AND EXHAUST GAS EMISSION. (Der Porsche-SKS-Motor: Gemischbildung, Verbrennung und Abgasemission). Text in German. Porsche Aktiengesellschaft, Stuttgart (Federal Republic of Germany). *Sci. Automob. Conf. Proc.*, Belgrade, Yugoslavia, 1975, p. 73-87. 17 refs. (April.)

The SKS-engine developed by Porsche to comply with more stringent engine exhaust emission regulations and to reduce fuel consumption is discussed. The engine is a stratified-charge combustion engine. It contains a subdivided combustion chamber and 3-stage combustion (SKS motor). Basic testing on an experimental single cylinder engine demonstrated a high degree of stability in its method of operation, and favorable exhaust emission and fuel consumption. Experiments involving multicylinder engines under stationary and intermittent working conditions yielded positive results. The course of combustion is essentially predetermined by the structure of the combustion chamber to such an extent that changed physicochemical properties of the fuel affect the combustion process only slightly. This permits the use of various alternative fuels. Many construction and operational parameters in the stratified charge engine require careful optimization. Only when this is done, and if a sufficiently long developmental is granted by legislation, can a satisfactory operation of the stratified charge engine with low exhaust emission and favorable fuel consumption be assured.

58511

APTIC NO. 83106

Gruenewald, Gerhard and Gerhard Hochgesand

PROCESS FOR REGENERATING ABSORBENT SOLUTIONS USED TO PURIFY GASES. (Metallgesellschaft Aktiengesellschaft, Frankfurt am Main (Federal Republic of Germany)) U. S. Pat. 3,880,615. 6p., April 29, 1975. 4 refs. (Appl. May 6, 1973, 3 claims).

A process for regenerating laden absorbent solutions resulting from a gas scrubbing operation carried out with an absorbent at ambient temperatures and under elevated pressures is described. An absorbent solution such as N-methylpyrrolidone is used to scrub acid components such as hydrogen sulfide from gases. The laden absorbent solution is regenerated by pressure relieving the laden solution in a plurality of stages and stripping the pressure relieved solution in a regenerating zone with a gas. The stripping gas used in the regenerating zone is formed by a preliminary pressure relief of the laden solution to an intermediate pressure between the absorption pressure and ambient pressure. This stripping gas is scrubbed before entering the regenerating zone with a branch stream of fully regenerated absorbent. (Author abstract modified)

58512

APTIC NO. 82123

Grulich, Heinz, Erich Hackler, and Manfred Galow

PROCESS AND APPARATUS FOR BURNING GAS AND VAPOR MIXTURE PRODUCED IN THE PURIFICATION OF COKE GAS OVENS. (Didier-Kellogg Industrieanlagenbau GmbH, Essen (Federal Republic of Germany)) U. S. Pat. 3,915,655. 5p., Oct. 28, 1975. 7 refs. (Appl. Aug. 27, 1973, 7 claims).

A process and apparatus for burning the gas mixtures which are obtained during the purification of coke oven gases is described. The process is applicable in treating ammonia vapors which are converted into nitrogen and water in a reducing atmosphere of a combustion furnace. The complete combustion of the ammonia vapors takes place in one reaction stage at a relatively low temperature and the exhaust gas produced from the reaction has a nitric oxide content of 150 ppm. This is achieved by a flame cone which possesses a region comprising a particularly strong reducing atmosphere into which the ammonia vapors are introduced. The gaseous combustion products are simultaneously cooled. The necessity for special catalysts in special reactors common in other processes is avoided. Through the fact that the three media, coke gas, ammonia vapor, and air for combustion, are fed separately but are combined in a specific manner, it is possible to maintain the optimal conditions of combustion in the flame cone even under different loads of the furnace. The heat generated during the combustion process is transferred by means of oil circulating in a closed system and parallel to the gaseous combustion products. The oil is cooled to recover heat for producing stripper steam. The process avoids the heat losses that take place where the gases of combustion are transferred to a waste heat boiler connected subsequently to the oven of combustion.

58513

APTIC NO. 82521

Gulati, Suresh T., Henry E. Hagy, and John S. McCartney

PRELOAD MEANS FOR CERAMIC SUBSTRATE IN EXHAUST GAS PURIFIERS. (Corning Glass Works, Corning, N. Y.) U. S. Pat. 3,892,537. 5p., July 1, 1975. 3 refs. (Appl. Nov. 28, 1973, 4 claims).

A catalyst support for an exhaust gas purifier is described which contains a cylindrical ceramic substrate with a helical groove on the periphery of the substrate. It is located within a cylindrical casing having a radially outward helical channel complementarily aligned with the helical groove of the substrate. The helical groove and helical channel define a helical conduit between the casing and the substrate. A compressible wire mesh rope of cross sectional area slightly larger than the cross sectional area of the helical conduit is compressed within the helical conduit along substantially the entire length of the

helical conduit to apply a radial pressure on the substrate periphery. This fixes the position of the substrate while allowing thermal expansion of the substrate into an annular space between the casing and the substrate. (Author abstract modified)

58514

APTIC NO. 81984

Gullett, James Thomas

PRODUCTION OF MONTMORILLONITE MATERIAL HAVING GOOD ENVIRONMENTAL AND ECOLOGICAL PROPERTIES. (Dresser Industries, Inc., Dallas, Tex.) U. S. Pat. 3,914,384. 4p., Oct. 21, 1975. 3 refs. (Appl. Aug. 28, 1974, 6 claims).

A process for the production of montmorillonite (a magnesium clay mineral) is described which provides a final product with a more uniform particle size than heretofore possible and which reduces airborne dust pollution. Raw mined montmorillonite is simultaneously dried and comminuted at a moisture content of at least 20% to a discrete particle size of -200 mesh. The material is air classified to provide a Fisher Average Diameter between about 6 and 25 micron. The processed montmorillonite is essentially free of airborne dust particles ranging from 1-3 micron in size.

58515

APTIC NO. 82656

Gustavsson, Karl-Axel G. and Holger A. Persson

COMPACT FILTER CELLS. (AB Bahco Ventilation Corp., Enköping (Sweden)) U. S. Pat. 3,880,628. 4p., April 29, 1975. 3 refs. (Appl. May 31, 1974, 1 claim).

A securing and guiding arrangement for compact filter cells consisting of a folded web of textile material is described. All of the passages are open in one and the same mutual direction and are closed in the opposite direction. Each of the passages is shaped in a particular cross sectional square shape. The passages are arranged in an upper frame which comprises part of a right angled parallel epipedic filter cassette. The cassette frame consists of rectangular upper and lower frames, the corners of which are connected by means of support and distance rods. The support stays take up the high pressure load acting on the filter cell, which load occurs at the exit end of the filter cell when the filter is being blown clean. Problems of leakage common in other filters because of the high pressure drop are eliminated.

58516

APTIC NO. 82307

Guyot, Gilbert, Pierre Mathieu, Andre Philippe, Pierre Grancher, and Jean Solinhac

PROCESS TO RECOVER SULPHUR FROM THE SULPHUR COMPOUNDS CONTAINED IN RESIDUAL GASES. (Societe Nationale des Petroles (France)) U. S. Pat. 3,890,120. 9p., June 17, 1975. 4 refs. (Appl. April 13, 1973, 15 claims).

A process for removing small concentrations of hydrogen sulfide, sulfur dioxide, and possibly vesicular sulfur from residual gases and recovering these compounds in the form of sulfur is described which is not subject to drops in the level of purification that occur with prior art processes. The residual gas is passed over an alumina-based adsorbent at a temperature of between atmospheric and 180 C. The sulfur-loaded adsorbent is then brought into contact with a hot gaseous fluid which desorbs the sulfur and regenerates the adsorbent. The length of contact between the residual gas and the adsorbent is between 1 and 25 sec. The sulfur-loaded adsorbent is subsequently regenerated using an oxygen-free gas, preferably a gas containing hydrogen sulfide, at a temperature of between 200 and 350 C. The regeneration is followed by blowing the regenerated adsorbent with a gas containing water vapor to cool it to the temperature required for contact with the untreated gas. (Author abstract modified)

AIR POLLUTION ABSTRACTS, JUNE 1976

58517

APTIC NO. 83122

Haas, Larry A., Sanaa E. Khalafalla, and Thomas H. McCormick

DOUBLE LAYER CATALYST BED FOR REMOVING SO₂ FROM WASTE GASES. (Dept. of the Interior, Washington, D. C.) U. S. Pat. 3,888,970. 4p., June 10, 1975. 5 refs. (Appl. Feb. 12, 1973, 6 claims).

A double layer catalyst bed for removing sulfur dioxide from waste gases is described. Dry waste gas containing SO₂ and carbon monoxide is passed through a double layer bed of catalyst at 400 C. The first layer consists of iron, chromium, nickel, manganese, or cobalt supported on alumina. The second layer consists of alumina. In comparison to the product gas of a conventional bed of iron supported on alumina at an operating temperature of 400 C, the double layer bed of this process results in a product gas containing less than 1/8 of the amount of gaseous sulfur compounds. (Author abstract modified)

58518

APTIC NO. 81754

Haase, Lawrence H. and David R. Liimatta

EVAPORATIVE EMISSION SYSTEM. (Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,913,545. 4p., Oct. 21, 1975. 5 refs. (Appl. April 4, 1973, 4 claims).

An evaporative emission control system for automobiles which does not adversely affect vehicle performance as a result of overly rich operation is described. The system contains a vapor storage canister which houses activated carbon for the adsorption of fuel vapors from various parts of the engine fuel system. The system selectively purges the fuel vapors for introduction to the engine intake manifold in response to engine loading and engine speed. The controlled purging results in vehicle performance which is superior to that associated with prior art evaporative emission control systems. (Author abstract modified)

58519

APTIC NO. 72677

Haefele, W.

ASPECTS OF FUTURE DEVELOPMENTS IN THE GENERATION, TRANSPORT AND HANDLING OF ENERGY. (Gesichtspunkte fuer die zukunfftige Entwicklung von Erzeugung, Transport und Handhabung von Energie). Text in German. Chem.-Ing.-Tech., 47(2):41-47, 1975.

The future development of primary and secondary energy is discussed with regard to economic and ecological impacts. The role of coal, petroleum, and natural gas will diminish and approach zero as will the corresponding global reserves, and four alternatives; nuclear fission, nuclear fusion, solar energy, and geothermal energy will be left. It will be primarily nuclear fusion and solar energy that will provide practically unlimited supply of primary energy, at least in principle. The utilization of geothermal energy is not yet feasible on a large scale, and it would involve considerable environmental impacts, and so would the large-scale utilization of solar energy due to its large space requirement and climatic changes that would ensue. As the share of electricity is expected to be limited to about 50%, nuclear energy will be used for a multitude of purposes, including the conversion of conventional and non-conventional fuels to facilitate their long-distance transport and utilization in closed cycle. Energy production will be limited more by the limited heat absorption and dissipation capacity than by the availability of primary energy carriers. The increase caused by energy production in the temperature of the atmosphere as well as in rivers and oceans is expected to influence the climate and precipitation pattern in different manners in different parts of the world, even if the mean temperature increase worldwide is negligible.

58520

APTIC NO. 82670

Hagen, Hermann

CONSTANT VOLUME COMBUSTION GAS TURBINE WITH INTERMITTENT FLOWS. (Motoren- und Turbinen-Union Munich GmbH, Munich (Federal Republic of Germany)) U. S. Pat. 3,877,219. 13p., April 15, 1975. 16 refs. (Appl. July 2, 1973, 67 claims).

A gas turbine engine arrangement for constant volume combustion is described. It includes a combustion chamber arranged downstream from a compressor supplying combustion air and upstream from a turbine accepting exhaust gases from the combustion chamber as driving gases. A closable valve is arranged between the combustion chamber and the compressor for intermittent blocking of the flow between them during constant volume combustion, while the exit end of the combustion chamber leading to the turbine is continuously open. The geometric configuration of the combustion chamber and of the exit from it is such as to assure constant volume combustion without the necessity of additional valving for closing off the exit. This is an improvement over conventional systems. (Author abstract modified)

58521

APTIC NO. 76094

Hall, Robert R. and Richard Dennis

MOBILE FABRIC FILTER SYSTEM DESIGN AND FIELD TEST RESULTS (FINAL REPORT). GCA Corp., Bedford, Mass., GCA/Technology Div., Environmental Protection Agency Contract 68-02-1075, Program Element 1AB012, ROAP 21ADM-010, Rept. EPA-650/2-75-059, GCA-TR-74-14-G(1), 136p., July 1975. 29 refs.

NTIS: PB 246287/AS

The design and operation of a mobile fabric filter constructed to study the effects of fabric filtration parameters when filtering an actual industrial effluent stream are described along with field test results. The system is designed for mechanical shake, pulse jet, or reverse flow cleaning. Field tests at a secondary brass foundry, a hot-mix asphalt plant, and a coal-fired utility boiler demonstrate collection efficiencies ranging from 99.62 to over 99.92%. Woven and felted Nomex and woven glass fabric test results are presented; the three cleaning methods are used with appropriate fabrics and emission sources. Dust emissions appear to result from direct penetration, seepage, dust shaken through the filter during cleaning, and dust that penetrates when air flow is resumed.

58522

APTIC NO. 82215

Hammer, K. and G. Koller

TREATMENT OF THE WASTE AIR FROM PIGSTIES. (Aufbereitung der Abluft aus Schweineställen). Text in German. Landtechnik, 30(10):432-434, Oct. 1975.

Three different methods for the deodorization of waste air from pigsties were tested. The ultraviolet irradiation method, in which active oxygen and ozone are generated in the irradiated air for the oxidation of the malodorous components, abated odor by 42% during the first days, but dropped rapidly to 22-29%. Another method which combines adsorption and oxidation on a catalyst-treated filter Collo-Sanilan DU 134 reduce the malodorous emissions by 63% initially, and by 43% after 41 days. A biological method using percolating bodies with bacterial growth proved to be most efficient in the long run; it reduced the odor intensity by 74-78%.

58523

APTIC NO. 82838

Hammerschmied, Georg

CARBURETOR FOR INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,883,621. 6p., May 13, 1975. 18 refs. (Appl. Jan. 10, 1973, 7 claims).

A carburetor for internal combustion engines is described which consists of flow control surfaces located in the air intake. These surfaces allow the carburetor to attain the ideal condition where complete combustion is achieved at minimum

temperatures by appropriately controlling the combustion process over the entire load area of the engine at a minimum of structural and financial expense. There is emphasis on reducing the percentage of carbon monoxide and nitrogen oxides exhaust emissions. Work centers on the development of high grade fuels, improvement in the combustion process, and the addition of exhaust gas decontamination equipment. The equipment has failed to attain general acceptance because of its high cost and considerable space requirements. The quality of combustion in the cylinders is largely dependent upon the quality of the preparation of the fuel and air mixture. Where engines feature external mixture formation, it is necessary to provide for the most uniform mixture formation possible in all load areas in the carburetor area in addition to a design of the inlet port system ensuring optimal flow conditions. Special carburetors are known to achieve a reduction of the fuel consumption and/or an increase in engine performance by installing appropriate units in the suction pipe. All of these designs fail to contribute essentially to a reduction of the noxious components of exhaust gases, while the inserts generally produce a high resistance to flow in the intake duct. The often very expensive inserts tend to increase the production cost of the carburetor to a considerable extent.

58524

APTIC NO. 80311

Hamrin, Charles E., Jr. and Peter S. Maa

DESULFURIZATION AND DEAGGLOMERATION OF WESTERN KENTUCKY COAL USING BOTTOM-ASH. Fuel, 54(4):288-293, Oct. 1975. 18 refs.

The desulfurization and deagglomeration of Western Kentucky coal using bottom ash are discussed. Fluidization of bottom ash from a producer gas generator with Kentucky no. 9 coal at a temperature of 870 C reduces the hydrogen sulfide emitted and prevents agglomeration of the coal at bottom ash/coal ratios greater than 0.4. The sorption capacity of the ash ranges from 1.6 to 9.4 mg sulfur/g bottom ash at this temperature. Scanning electron microscopy illustrates the growth of coal particles on heating and the various stages of melting and sphere formation. (Author abstract modified)

58525

APTIC NO. 83992

Hansen, W.

BALANCE OF FIRING TECHNOLOGY II. (Bilanz der Feuerungstechnik (II)). Text in German. Oel Gasfeuerung, 20(12):618-621, 1975. 7 refs.

A state-of-art report is presented on domestic firing technology and on the use of different energy carriers with respect to the recent energy crisis and to environmental concerns. Increasing use of gas, and a reduction in the number of individual stoves and in the use of solid fuels are the basic developments in connection with the energy crisis, which has resulted in an increased awareness of energy economy through proper burner adjustment and combustion control. The requirements for clean combustion conflict with the need to reduce the nitrogen oxides emissions. They can be abated by stepwise combustion, and through the injection of water or steam into the combustion chamber. The combustion properties can be improved by atomization to obtain a droplet size below 30 micron by the addition of metal salts with catalytic action and by the use of water-in-oil emulsions, which is especially efficient in the case of heavy fuel oil.

58526

APTIC NO. 82141

Hara, Haruichi, Shoichi Ichihara, Koichi Saito, Tomohisa, Ohhata, Koshi Horie, and Takashi Ohara

METHOD FOR THE PRODUCTION OF EXHAUST OR WASTE GASES PURIFYING CATALYSTS. (Nippon Shokubai Kagaku Kogyo Co., Ltd., Osaka (Japan)) U. S. Pat. 3,898,184. 10p., Aug. 5, 1975. 8 refs. (Appl. Aug. 17, 1973, 16 claims).

An oxidation catalyst for the purification of exhaust gases from internal combustion engines and industrial sources is

described which is capable of retaining its original activity over a long working period. The catalyst is produced by soaking a granular activated alumina support in an aqueous solution containing trivalent and hexavalent chromium ions in a chronic atomic ratio of 1:1 to 1:20. The pH is adjusted to 0.5-4.5 so that the chromia compounds are deposited in a total amount corresponding to 5-30 wt% of chromia to the catalyst. The support is dried and calcined and is then treated with an aqueous solution of a palladium or platinum compound for the deposition of the latter in an amount corresponding to 0.05-2 g/l of catalyst. The treated support is dried and activated. The activation is performed by calcining the dried support catalyst at 300-800 C in an oxidative atmosphere or heating it at 80-250 C in the presence of a vaporized organic reducing agent.

58527

APTIC NO. 79691

Harada, Y.

OFFENSIVE ODOR REMOVAL AT THE SEWAGE TREATMENT PLANT. (Gesui Shorijo ni okeru dashu). Text in Japanese. Gesuido Kyokai. (J. Japan Sewage Works Assoc.), 12(132):64-68, May 1975.

The practical capacity of deodorization systems of sewage treatment plants was investigated through a questionnaire answered by 30 cities in Japan, of which use covered systems to control odor pollution. In most cases, this control was requested by the neighboring residents. The top area of the covered system usually serves the public as a park. The methods of ventilation and deodorization differ in each city; specific information is tabulated. The difficulty of quantitative measurement of odors makes difficult the estimation of the capacity of ventilation and deodorization facilities. More study is needed to develop design criteria.

58528

APTIC NO. 82679

Hart, Wallace L., Gordon D. Vevang, and Herman J. Walkowicz

COMBINATION FUME OXIDIZER AND ASPHALT HEATER. (U.I.P. Engineered Products Corp., Elk Grove Village, Ill.) U. S. Pat. 3,880,143. 8p., April 29, 1975. 4 refs. (Appl. Feb. 21, 1973, 18 claims).

A combined fume oxidizer and asphalt heater is described which substantially reduces the odorous fumes normally associated with the production of asphalt roofing materials. These fumes are utilized to heat additional asphalt and are substantially combusted. The fumes from an asphalt shingle saturation machine are directed through a burner of the gas or oil type and the combined streams of burned gases are utilized to heat asphalt material. The heat of combustion is controlled by a thermocouple and the temperature in the heating chamber by by-passing a portion of the combined combusted streams away from the heating chamber and into an exhaust duct to which the other portion of the combusted gases is directed after heating the asphalt material. A damper control directs the portions of the combusted gases to the heating chamber or through the by-pass ducts depending upon the temperature desired in the heating chamber for heating the asphalt material. (Author abstract modified)

58529

APTIC NO. 82996

Hasegawa, Tsuneo and Kiyoharu Nakahara

APPARATUS FOR REMOVING ACID GAS FROM WASTE GAS. (Assignee not given.) U. S. Pat. 3,871,987. 7p., March 18, 1975. 3 refs. (Appl. Feb. 14, 1974, 8 claims).

An apparatus for removing sulfur oxides, nitrogen oxides, and acid gases from waste gases is described. It includes a first reactor for reacting the acid gas with an alkaline solution of aluminic acid to form a reaction product of the acid gas and aluminum. The first reactor is connected to a first conduit for introducing the waste gas into the reactor; a second conduit for discharging the waste gas after the acid gas has been removed; and a third conduit for discharging the reaction

product from the reactor. The reaction product of aluminum and acid gas recovered as the by-product is useful as a coagulant for the treatment of a water supply including waste water, and is very valuable in controlling pollution. The apparatus is excellent in performance, safety, operation, and economy as compared to conventional systems. (Author summary modified)

58530

APTIC NO. 82963

Hata, Takashi

STACK GAS DESULFURIZATION FACILITIES FOR SMALL SCALE BOILER BY ROTARY AND WASHING TYPE ALKALI NEUTRALIZATION METHOD. (Shokibo boira yo kaiten senjo arukari chuwa ho haen datsuryu sochi). Text in Japanese. Boira Gishi (Boilermen), 30(11):971-978, Nov. 1975.

The stack gas desulfurization device of the Riken Koki Co. is described. It is designed for small scale boilers and uses a rotary washing type alkali neutralization method. The rotary washing device which was developed, commercialized, and achieved satisfactory performance, consists of a cylindrical washing chamber containing a rotating drum with spray nozzles on the outer surface. This device is superior in catalytic efficiency to conventional wet type desulfurization devices. Assembly and installation are easy, maintenance is light, and it is a compact unit. The disadvantages of the unit include a maximum treating capacity limited to 60,000 N cu m/hr. Caustic soda is used as an alkali neutralizer because of its availability and low cost; the operator must be cautious of its dangerous nature, and some consideration must be given to discharging of waste water.

58531

APTIC NO. 82976

Hausberg, Gerhard, Georg Kruger, and Karl-Martin Zentgraf

PROCESS FOR REMOVING SULFUR OXIDES FROM INDUSTRIAL WASTE GAS. (Firma G. Bischoff Bau Kompletter Gasreinigungs- und Wasserruckkulanlagen KG, Essen (Federal Republic of Germany)) U. S. Pat. 3,906,078. 4p., Sept. 16, 1975. 4 refs. (Appl. July 7, 1972, 3 claims).

A process for removing sulfur oxides from industrial waste gas is described. Hot waste gases containing sulfur dioxide and trioxide are saturated with water vapor and admixed with lime, in the form of finely comminuted particles. The water condenses on the particles upon cooling of the gas stream by adiabatic expansion. The sulfur oxides, reacting with the lime of the particles, are converted into calcium sulfite and sulfate which dissolve in the precipitating droplets. Unlike prior systems, this system uses reduced quantities of liquid at an elevated reaction temperature conducive to efficient solubilization. (Author abstract modified)

58532

APTIC NO. 82555

Hauser, Karl V.

GAS SCRUBBING SYSTEM. (Edw. C. Levy Co., Detroit, Mich.) U. S. Pat. 3,876,750. 6p., April 8, 1975. 1 ref. (Appl. Dec. 12, 1972, 2 claims).

A gas scrubbing system for removing particulates from power plant boilers or lime kilns is described. The lime kiln gases or the scrubbing water is saturated with limestone or other calcium compounds which tend to form scale in the scrubber and other mechanical parts of the purification system. Ammonium chloride is added to the water to inhibit the formation of undesirably large scale deposits in the scrubber and related apparatus. (Author abstract modified)

58533

APTIC NO. 83356

Hawkins, Gilbert L.

THERMAL RECOVERY SYSTEM. (Assignee not given.) U. S. Pat. 3,888,084. 5p., June 10, 1975. 5 refs. (Appl. May 20, 1974, 6 claims).

A system for recovering waste heat from an internal combustion engine is described in which heat lost in the cooling and exhaust system is converted into useful energy. The heat exchanger has a coil containing refrigerant which absorbs heat from the coolant, leaving the engine to produce high pressure refrigerant gas. The gas is supplied to a refrigerant motor connected to the engine crankshaft, and gas discharged from the motor is pumped back to the heat exchanger. The coolant discharged from the first heat exchanger is passed to a second heat exchanger having a coil conveying engine exhaust gas which imparts heat to the coolant prior to being recycled to the engine. The coolant can be diverted to the engine radiator if the engine becomes overheated. No apparatus is known which utilizes a refrigeration system to recover waste heat from an automobile engine. (Author abstract modified)

58534

APTIC NO. 81755

Hayashi, Mikio

ANTIPOLLUTION APPARATUS FOR MOTOR VEHICLE ENGINES. (Hayashi Seiko Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,913,540. Sp., Oct. 21, 1975. 7 refs. (Appl. Feb. 6, 1974, 7 claims).

An antipollution apparatus which simultaneously reduces hydrocarbon and nitrogen oxide emissions from automobiles while not affecting engine performance is described. The device is designed for use with the vehicle's ignition advancing mechanism which advances the spark timing by utilizing a variable degree of vacuum created adjacent the carburetor outlet in accordance with the throttle opening. The antipollution apparatus is composed of a dual diaphragm valve which is affixed to the intake manifold in a position adjacent its entrance. The ignition advancing mechanism communicates with the carburetor via the valve. A pair of spaced-apart diaphragms in the valve deflects simultaneously in response to a prescribed degree of vacuum that builds up within the intake manifold. Ignition advance is canceled each time the load on the engine decreases to a prescribed level. (Author abstract modified)

58535

APTIC NO. 83729

Hayashi, Tsutomu

ELECTROSTATIC PRECIPITATOR FOR HEAVY METAL DUST COLLECTION. (Jukinzoku dasuto hoshuyo denki shujin sochi). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(11):988-992, Nov. 1975.

A general discussion of electrostatic precipitators made by Nafco for heavy metals industries is given. Needle-type discharge electrodes were used to replace the large electrodes of conventional electrostatic precipitators. Thin discharge electrodes (0.8 mm in diameter with a tip 0.2 mm in diameter) gave strong corona discharge at low voltage. The problem of dust deposition on the discharge tip was also eliminated by employing needle discharge electrodes. Inverse ionization occurs when dusts of high resistance accumulate on discharge electrodes. Lead oxide or lead sulfate dusts which have extraordinary high inherent resistance are always accompanied by inverse ionization. High voltage was not needed in Nafco electrostatic precipitators, which greatly reduced the operating cost.

58536

APTIC NO. 82967

Hayashi, Yoshio, Hiroo Hayashi, and Kiyoshige Hayashi

DESULFURIZATION METHOD FOR PETROCHEMICAL HYDROCARBON OIL. (Sekiyu tanka suisoyu no datsuryuho). Text in Japanese. (Hayashi, Yoshio, Hiroo Hayashi, and Kiyoshige Hayashi (Japan)) Japan. Pat. Sho 50-31161. 3p., Oct. 8, 1975. (Appl. Aug. 14, 1971, 1 claim).

A desulfurization method for petrochemical hydrocarbon oil is presented. A new, inexpensive method to process fuel oil so that only a small amount of sulfur remains in the oil is described. The main feature of the process is the choice of catalysts; a group Ib metal of the periodic table such as copper, silver or gold, and a group VIII metal such as iron,

nickel, white gold, cobalt, or palladium. Pulverized metal catalysts are dispersed into molten metals with a low melting point of 200-500 C such as lead, tin and zinc, into which petrochemical hydrocarbon oil and hydrogen gas are introduced while the catalytic temperature is kept at 300-550 C. The desulfurization efficiency of the group Ib metals is superb and the tar and carbon of the desulfurization products will float to the surface of the molten metal, and will not interfere with the long and continuous desulfurization reaction.

58537

APTIC NO. 84141

Hayashida, Motoyuki, Kuniyuki Toyama, and Masanori Kurokawa

EXHAUST GAS RE-CIRCULATING TYPE ROTARY PISTON ENGINE. (Toyo Kogyo Co., Ltd., Hiroshima (Japan)) U. S. Pat. 3,897,755. 4p., Aug. 5, 1975. 3 refs. (Appl. May 9, 1973, 2 claims).

An exhaust gas recirculating type rotary piston engine is described which particularly reduces nitrogen oxides. It is arranged so that the reintroduction of the exhaust gas into the suction space is achieved by a simple construction. This permits the elimination of the objectionable components contained in the exhaust gas without lowering the output of the engine. (Author summary modified)

58538

APTIC NO. 82812

Hecht, Victor

CONTROL VALVE. (C. Wayne Stearns, Haysville, Kans.) U. S. Pat. 3,880,130. 8p., April 29, 1975. 8 refs. (Appl. April 23, 1973, 1 claim).

A control valve is resiliently urged to a normally closed position. The valve is connected in a line between the crankcase and intake manifold of an engine, and in use the valve is open when there is normal operating pressure in the intake manifold. The valve closes when the intake manifold pressure rises above normal to prevent flow from the crankcase into the intake manifold. The control valve retains a normally closed position until pressure in the intake manifold is substantially below atmospheric pressure and at a predetermined value. Then the control valve is opened to pass air and the crankcase vapors from the crankcase into the intake manifold. Deceleration of the engine and the drop in intake manifold pressure causes an excess of gasoline or fuel to be pulled into the intake manifold through the idle circuit portion of the carburetor until the engine reaches the idle speed and pressure in the intake manifold reaches a constant level. An excess of fuel passed through the engine at this time causes an increase in objectionable exhaust emissions during such deceleration. (Author abstract modified)

58539

APTIC NO. 83314

Hecht, Victor

CRANKCASE FUMES TREATMENT. (C. Wayne Stearns, Haysville, Kans.) U. S. Pat. 3,903,858. 6p., Sept. 9, 1975. 6 refs. (Appl. April 23, 1973, 1 claim).

A crankcase fumes treatment apparatus is described. It has a trap connected to the engine crankcase and to the intake manifold. The trap separates liquid and gaseous portions or vapors passed therethrough. The apparatus has a heat exchanger in the engine exhaust manifold which is connected in the conduit from the trap to the intake manifold to heat vapors passing therethrough. Other devices are used with a series of control valves and vapor filters to treat the vapors before introducing them into the intake portion of the engine. These devices utilize filter structures which must be periodically removed and cleaned or removed and replaced. (Author abstract modified)

58540

APTIC NO. 82818

Hegarty, William P.

METHOD FOR PRODUCTION OF SYNTHETIC NATURAL GAS FROM CRUDE OIL. (Assignee not given.) U.

S. Pat. 3,870,481. 12p., March 11, 1975. 6 refs. (Appl. Oct. 12, 1972, 19 claims).

A process is provided for the production of a pipeline gas of high heat content from crude oil by hydrogasification of the crude oil. The crude oil is first vaporized in the presence of hydrogen and then gasified to form an effluent gas containing essentially methane, ethane, aromatic hydrocarbons, hydrogen, and hydrogen sulfide. The effluent is subjected to cryogenic separation of the hydrogen and a final catalytic conversion of the ethane to methane after separation of the aromatics and hydrogen sulfide from the effluent. The various side streams can be used to produce sources of reactant or heat for operating the plant utilities. (Author abstract modified)

58541

APTIC NO. 82098

Heidacker, Walter C.

CARBURETED AIR PREHEATER STOVE. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,914,937. 5p., Oct. 28, 1975. 4 refs. (Appl. Sept. 3, 1974, 2 claims).

A carburetor air preheater stove is described which fits over a catalytic converter. This stove does not require fasteners common in other systems. The stove is provided with dimples which position and firmly hold it on the converter while maintaining an annular air space along the converter which is open at one end to the atmosphere and at the opposite end to air space between closed ends of the stove and converter. The latter space is connected by a short tube to the air horn of the carburetor air cleaner. The stove is made to extend along almost the full length of the converter and atmospheric air entering the stove through its open lower end passes upwardly about the converter and then over the closed end thereof to the stove outlet tube. The air is passed over a very large heated surface area to assure that it is heated a substantial amount before delivery to the carburetor.

58542

APTIC NO. 84119

Heinrichs, F.

EQUIPMENT AND PLANTS FOR ENVIRONMENTAL PROTECTION. (Einrichtungen und Anlagen fuer den Umweltschutz). Text in German. Aluminium, 51(10):J367-J368, 1975.

Equipment and installations for ecological protection from industrial pollution were discussed. Wet-dust separators to resolve the dust problem were used in foundries, mechanical production plants, conveying systems and the chemical industry. Wet-dust separators with a dry mud-discharge were used for environmental protection of the workplace by producing a dense watery mist whereby dust particles were thoroughly wetted. These separators were designed for an air output of 6300-80,000 standard cu m/hr. Thermal waste gas purifiers were built for converting organic gases or vapors into carbon dioxide and water vapor. They were composed of concentric air duct cylinders in which the exhaust air was carried in a countercurrent cooling the interior wall. In the air space, torque movements and pulsations occurred effecting a thorough mixing of combustion air and exhaust, and therefore resulted in a rapid combustion. Removal of discarded cardboard and waste paper in industry was handled by baling presses. Dustless vacuum sweepers were built for use in finishing halls and storage space and designed for an areal efficiency of 2700 sq m/hr. They could be equipped for gasoline, fuel or battery propulsion. Larger hydraulically operated types were developed for vast industrial halls.

58543

APTIC NO. 76464

Helfrich, Dennis J.

THE PREDICTION OF BAGHOUSE PERFORMANCE BY MEANS OF A SMALL, FIELD TEST INSTRUMENT. Preprint, Dustex Corp., Buffalo, N. Y., 8p., 1975. 6 refs. (Presented at the National Conference on Energy and the Environment, 3rd, Sept. 29-Oct. 1, 1975.)

AIR POLLUTION ABSTRACTS, JUNE 1976

A small test instrument is described, designed to accomplish the objectives of pilot plant baghouse testing at a fraction of the cost and effort. The instrument isokinetically samples approximately 10 CFM from the gas stream to which a baghouse is to be applied. The miniature single bag pilot can be calibrated such that the data obtained from its application, when properly interpreted, predict the pressure loss versus air cloth ratio characteristics of a full scale baghouse. Operational baghouse parameters, such as cleaning frequency and intensity, are adjustable, and their influence on baghouse performance can be charted. The relative performance of different fabrics can be readily determined, and the instrument indicates the presence of severe problems such as corrosive gases or sticky particles. This instrument is fully portable and is designed for high temperature field testing. Field experiences and calibration methods are discussed. (Author abstract modified)

58544

APTIC NO. 80282

Helfrich, D. J. and G. H. Beach

COAL FIRED BOILER FLYASH CONTROL BY BAG FILTERS. Preprint, Dustex Corp., Buffalo, N. Y., 7p., 1975. (Presented at the Energy and the Environment National Conference, 3rd, Sept. 29-Oct. 1, 1975.)

Various bag filter fabrics were tested on coal-fired boilers during pilot and field trials. Nomex felt and 14-ounce/sq yd fiberglass were rejected for use during pilot tests because of their relatively short lifetimes. Fiberglass bags installed in a 40,000 lb/hr boiler baghouse demonstrated an operational lifetime of 1-2 mo, while identical bags in a 75,000 lb/hr baghouse showed a lifetime of 6-9 mo. The difference was attributed to the higher average pressure drop under which the 40,000 lb/hr baghouse operated. Teflon fabric showed a lifetime of more than 1 yr, though its efficiency of fly ash collection was relatively poor. An outlet dust concentration of 0.12 grains/standard cu ft was obtained with this material at a flow of 7.6 CFM/sq ft. Gore Tex fabric installed in a 40,000 lb/hr baghouse proved more effective, resulting in an outlet dust concentration of 0.04 grains/standard cu ft at a flow of 8.2 CFM/sq ft. The life of this fabric was not estimated.

58545

APTIC NO. 82171

Helke, Risto, Jorma Petajisto, Hakan Romantschuk, Tuomo Ruohola, and Antti Salonen

ARRANGEMENT FOR REGULATING THE SUPPLY OF COMBUSTION AIR AND THE EXCESS OF OXYGEN IN REGUSE BURNING OVENS. (Oy Tampella AB, Tampere (Finland)) U. S. Pat. 3,894,497. 4p., July 15, 1975. 5 refs. (Appl. March 15, 1974, 3 claims).

Refuse containing combustible components of variable calorific content is completely burned in a furnace having a vertical shaft for a combustion zone and a grate through which molten incombustibles and gaseous products of combustion are discharged downward into a pit. Annular streams of preheated air are injected inwardly and downwardly into the mass of refuse on the grate. Gaseous combustion products in the pit are continuously analyzed for the presence of free oxygen or incompletely burned combustibles. Combustion air is caused to travel through a thinner layer of refuse by injecting it at a lower point if combustion is not complete, or through a thicker layer of refuse by injection at a higher level if excess free oxygen is present. Regulation of the level of injection is achieved by control means connected to the analyzer and to valves in the air inlet lines. Discharge into the atmosphere of malodorous and noxious gaseous products is avoided. (Author abstract modified)

58546

APTIC NO. 79658

Helmenstein, Siegfried

COMBINED TRASH/COAL INCINERATION FOR POWER GENERATION AS EXEMPLIFIED BY THE PLANT ST. LOUIS, U.S.A. (Kesselseitig kombinierte Muell-Kohleverbrennung zur Energiegewinnung am

CONTROL METHODS

58551

Beispiel der Anlage St. Louis, USA). Text in German. Muell Abfall, 7(5):134-138, 1975. 2 refs.

Two boilers of the Meramec power plant at St. Louis, have been converted for the joint combustion of coal and finely ground trash from which inert components had been separated. The calorific value of the trash amounts to 2460 kcal/kg against 6100 kcal/kg for the coal used. The trash contains 0.3% chlorine against 0.04% in the coal, while the latter contains 3.5% sulfur, and trash contains only 0.1%. Some 10% of the total thermal energy is generated with trash. The chlorine concentration in the flue gases was 50 mg/cu m, 45% of which is attributable to the chlorine content of the trash. For comparison, the maximum allowable chlorine concentration in flue gases is limited to 100 mg/cu m in West Germany. Conversion of another large-capacity power plant of Union Electric Company at Labadie to the simultaneous firing of coal and pretreated trash is being envisaged.

58547

APTIC NO. 82485

Hemsath, Klaus H. and Arvind C. Thekdi

METHOD FOR INCINERATING FLUE GASES.

(Midland-Ross Corp., Cleveland, Ohio) U. S. Pat. 3,898,317. 4p., Aug. 5, 1975. 4 refs. (Appl. Feb. 25, 1974, 3 claims).

An incineration system for incinerating flue gases which contain varying quantities of combustibles is described. A controlled amount of combustion air is added to the flue gases at a specific temperature. When the preset temperature is exceeded, additional air is added to reduce the temperature of the gas, but when the temperature falls below the preset point, the burner firing rate is increased and the added air is cut off to insure proper incineration and fuel efficiency. Presently available incinerators are not able to complete combustion of the exhausts, thereby yielding exhaust gases with high quantities of pollutants. (Author abstract modified)

58548

APTIC NO. 82077

Henkel, Hans-Joachim, Christian Kock, Alfred Michel, Richard Schnarz, and Hana Kostka

METHOD FOR THE OPERATION OF INTERNAL COMBUSTION ENGINES AND GAS REFORMER FOR IMPLEMENTING THE METHOD. (Siemens Aktiengesellschaft, Munich (Federal Republic of Germany)) U. S. Pat. 3,915,125. 12p., Oct. 28, 1975. 7 refs. (Appl. Feb. 6, 1974, 23 claims).

A method and apparatus for the operation of a gas reformer in conjunction with an internal combustion engine for reducing exhaust pollutants are described. A mixture of fuel and primary air and/or exhaust gas is converted into soot-free reformed gas in the presence of a catalyst. The reformed gas and secondary air are then supplied to the internal combustion engine and may be recirculated through the gas reformer. From start-up to warm-up to operation under load, fuel is mixed with a decreasing percentage of slightly understoichiometric supply of primary air. For operation under load, the primary air is largely replaced by exhaust gas which heats up the mixture fed to the catalyst in the gas reformer. During operation under load, reformed gas is generated as needed by the internal combustion engine by supplying fuel, exhaust gas, and primary air in accordance with the temperature of the catalyst. Operation with a fuel that contains aromatic hydrocarbons is possible because the aromatic hydrocarbons can be decomposed into harmless components. Operation directed toward cracked gas containing methane and carbon monoxide, and possibly hydrogen, means a substantial reduction of polluting nitrogen oxides, such as nitric oxide, nitrogen dioxide, and N₂O₄. As compared to a conventional carburetor, the efficiency of this method is increased by the fact that a specific power reduction in displacement/cylinder is over compensated by a reduction of the specific fuel consumption/work spent. (Author abstract modified)

58549

APTIC NO. 82368

Henkel, Hans-Joachim, Eugen Szabo DeBucs, and Christian Kock

METHOD AND APPARATUS FOR GENERATING A GAS MIXTURE TO BE FORMED THROUGH CATALYTIC CONVERSION OF FUEL AND A GAS SERVING AS AN OXYGEN CARRIER. (Siemens Aktiengesellschaft, Munich (West Germany)) U. S. Pat. 3,897,225. 8p., July 29, 1975. 9 refs. (Appl. June 21, 1973, 14 claims).

A gas reformer for converting liquid fuel such as gasoline to a gaseous fuel that can be used to operate internal combustion engines at lower exhaust emission levels is described. The reformer overcomes prior art difficulties associated with the discharge of unconverted starting fuel from the reaction chamber. Several successive reaction stages are provided so that any portion of the fuel not converted in a first reaction stage is converted in a succeeding reaction stage, with gas serving as an oxygen carrier and being mixed with the flow through the reactor ahead of each further reaction stage. The amount of oxygen in the gas mixture is increased with decreasing temperature. (Author summary modified)

58550

APTIC NO. 82584

Heywood, John B.

IMPACT OF EMISSION CONTROLS: 1968-1974. In: *The Automobile and the Regulation of its Impact on the Environment*. Norman, Okla., Oklahoma Univ. Press, 1975, Chapt. 4, p. 115-150. 25 refs.

The impact of automotive emission controls is evaluated for the period 1968-1974. Aggregate urban hydrocarbon and carbon monoxide emissions from the total in-use automobile population are 30% below the peak 1967 pre-control rates. Aggregate nitrogen oxide emission rates are only 5% below the peak emission rate of pre-controlled vehicles due to significant increases in NO_x emission rates from 1967-1972 in the absence of NO_x emission standards. These figures are based on the assumption that the 1975 Federal Test Procedure is an accurate measure of the appropriate average vehicle urban emission rates. This latter assumption remains to be confirmed. (Author conclusions modified)

58551

APTIC NO. 82667

High, Carl F.

PRESSURE CARBURETOR SYSTEM FOR MANIFOLD DISTRIBUTION. (Assignee not given.) U. S. Pat. 3,877,449. 10p., April 15, 1975. 12 refs. (Appl. June 14, 1973, 14 claims).

A pressure carburetor system for manifold distribution in internal combustion engines is described. The reduction of discharge residue and resultant toxic gases emitted by internal combustion engines, particularly in automobiles and large commercial vehicles is part of a total effort aimed at reducing smog or polluted air concentrations in the larger cities. Efforts toward reducing the discharge residue are directed toward the improvement of the engine combustion characteristics, since by optimizing the combustion process fewer unburned and partially burned components are available for discharge to the atmosphere. These efforts are only sporadically successful. This system improved engine combustion by thoroughly diffusing and mixing the fuel and air and by completely vaporizing the atomized fuel in the fuel-air charge, thereby reducing the quantity of unburned hydrocarbons and carbon monoxide. The formation of nitric oxide is prevented by the introduction into the fuel air mixture of a definite quantity of engine exhaust gases. A fog cools the combustion processes, thereby avoiding the heat plus pressure combination which otherwise causes the formation of nitric oxide. (Author summary modified)

58552

APTIC NO. 79652

Hiller, Heinz

PROGRESS WITH COAL GASIFICATION? (*Fortschritte in der Kohlevergasung*). Text in German. Chem. Ind. (Duesseldorf), 27(7):3760379, 1975. 12 refs.

Recent developments in the area of coal gasification in Europe and in the USA are described in connection with the Lurgi high-pressure gasification process. The rise in the price of petroleum has not been sufficient to lead to a worldwide acceptance and introduction of the coal gasification technology, but it did prompt developments in this area. Due to the high price of coal relative to other energy carriers in West Germany, coal gasification for energy supply and for the chemical industry is not expected to become economical before 1985. Compared with the Koppers process, the Lurgi process has the disadvantage that it generates tar, oil, gasoline, phenols, ammonia, and other impurities which have to be removed. On the other hand, the high-pressure Lurgi process is best suited for gas production for supply networks. The production of substitute natural gas by catalytic processes especially requires purification of the raw gas, which problem can be efficiently solved by the Rectisol method, using methanol as scrubbing liquid at around -52 C. Thus, it is possible to reduce the sulfur content of the gas to 0.2 ppm. The gas thus cleaned can be converted to substitute natural gas by the catalytic conversion of carbon monoxide and hydrogen into methane. A power plant with 160 MW capacity has been combined with a Lurgi system high-pressure gasification plant, and it includes a gas generator, expansion turbine, gas turbine, and steam turbine. The power plant has an increased thermal efficiency at reduced investment cost.

58553

APTIC NO. 83077

Hilsheimer, Hellmuth and Peter Mettler

AUTOMATIC CONTROL OF THE COMBUSTION PROCESS IN AN INCINERATOR. (*Automatische Regelung des Verbrennungsablaufs in einer Muellverbrennungsanlage*). Text in German. Siemens Z., 49(7):498-502, 1975. 7 refs.

Possibilities for the automatic control of the combustion process in waste incinerators are described. The considerable fluctuations in the furnace performance, combustion temperature (700-1300 C), in the ratio of radiation to convection, and in the composition of the flue gases require automatic combustion control for complete and economical combustion. The flue gas oxygen concentration or the flue gas temperature can be used as a basic parameter of combustion control.

58554

APTIC NO. 83349

Hinderliter, Charles R. and Russell E. Perrussel

SOLVENT REFINED COAL PROCESS WITH RETENTION OF COAL MINERALS. (*Dept. of the Interior, Washington, D. C.*) U. S. Pat. 3,884,796. 12p., May 20, 1975. 5 refs. (Appl. March 4, 1974, 18 claims).

A solvation process for producing deashed solid and liquid hydrocarbonaceous fuel from coal is described. Raw coal is slurred with a solvent comprising hydroaromatic compounds in contact with hydrogen in a first zone. This dissolves the hydrocarbonaceous fuel from coal minerals by transfer of hydrogen from hydroaromatic solvent compounds to hydrocarbonaceous material in the coal. The slurry is then treated with H₂ in the second zone to replenish the solvent with H₂. The process is improved in comparison to the prior art, by retention of coal minerals in the second zone. (Author abstract modified)

58555

APTIC NO. 82683

Hirai, Mineaki

ACTUAL STATUS OF STACK GAS DESULFURIZATION IN MOLYBDENUM REFINING. (*Moribuden seiren ni okeru haiei datsuryu no jissai*). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(12):1126-1134, Dec. 1975.

The article relates to a stack gas desulfurization device and its operation at the Monara Molybdenum refining plant of the Taenaka Mining Co., Ltd. The following subjects are discussed: production facilities, application of molybdenum, calcining processes for molybdenum, stack gas desulfurization systems, balance sheet for materials, analytic value of gypsum, direct operation costs, and state of exhaust gas disposal. Sulfur oxide discharged from the molybdenum sulfide calcination process is treated by the alumina-gypsum method, which recovers gypsum usable in the cement factories. However exhaust gas containing sulfur dioxide of 1.5% concentration must be treated in the desulfurization process after it is diluted to 0.75% concentration. This is because the SO₂ recovery rate increases when the SO₂ concentration in the exhaust gas decreases in the absorption column. A better absorption rate was achieved in 1975 than in 1974 after the solution temperature was raised to above 30 C.

58556

APTIC NO. 81060

Hirato, Mizuho, Yukio Saito, Takeo Komuro, Kuzunari Shimada, Hiroo Sakai, and Yoshihide Nishimoto

FLUIDIZED BED PYROLYSIS AND OIL RECOVERY PROCESS OF MUNICIPAL SOLID WASTES. Hitachi, Ltd., Ibaraki-Ken (Japan), Hitachi Research Lab., Tokyo (Japan), Environmental Control System Div., and Babcock-Hitachi, Ltd., Hiroshima-Ken (Japan), Kure Works, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 349-353. (Nov. 3-5.)

The composition of clean fuel obtained from the fluidized bed pyrolysis of municipal solid wastes is described. Products obtained by pyrolysis of feedstock are gas, oil, tar, water, and charcoal. The gas contains 60-70% nitrogen, 10-20% carbon monoxide and carbon dioxide, 1-3% hydrogen and 1-4% hydrocarbons. Its calorific value is between 500 and 1000 kcal/cu Nm. The values for oil, tar, and charcoal are 8000 kcal/kg, 4000 kcal/kg, and 6000 kcal/kg, respectively.

58557

APTIC NO. 80995

Hirayama, N.

CONTROL OF NOX EMISSION FROM MUNICIPAL REFUSE INCINERATORS. Tokyo Metropolitan Univ. (Japan) and Tokyo Metropolitan Government Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 197-201. (Nov. 3-5.)

The control of nitrogen oxides emissions from refuse incinerator furnaces by recirculating flue gas was investigated. The rate of combustion had no effect on emissions. The NO_x emissions increased with increasing furnace outlet gas temperature. The cooling air to regulate the furnace temperature should be supplied through the afterburning rate rather than from the outlet of the furnace. The calorific value of refuse influences the emission of NO_x. The fresh air preheat temperature should be lower than 150 C. Gas recirculation decreased the emission of NO_x; the odor of the decrease was 25%. A flue gas recirculation ratio of more than 20% was unnecessary.

58558

APTIC NO. 82542

Hirdler, Louis C.

PROCESS FOR DISPOSING OF OFF GASES CONTAINING CARBON DIOXIDE AND CHLORINE. (Olin Corp., New Haven, Conn.) U. S. Pat. 3,896,213. 4p., July 22, 1975. 10 refs. (Appl. July 5, 1973, 20 claims).

A process for disposing of off gases containing chlorine and carbon dioxide produced in hypochlorous acid generators is described. The off-gases are reacted with an aqueous solution of an alkaline compound and a reducing agent to produce a substantially neutral aqueous solution containing alkali metal salts which can be safely discarded. This disposal process can be used in a cyclic process for the production of chloroisocyanuric acids by the reaction of hypochlorous acid with cyanuric acid, an alkali metal cyanurate or an alkaline earth metal cyanurate, where chlorine containing CO₂ is used to generate hypochlorous acid. (Author abstract modified)

CONTROL METHODS

58564

58559

APTIC NO. 82852

Hirose, Yasuo

METHOD OF COMBUSTION. (Assignee not given.) U. S. Pat. 3,876,362. 5p., April 8, 1975. 5 refs. (Appl. March 18, 1974, 14 claims).

A method of combustion which reduces nitrogen oxides emissions is described. There are disadvantages in known methods of NOx reduction. Conventional systems require special equipment, can produce soot, or require large quantities of water which reduce heat efficiency. This method has none of these problems. The fuel is injected at a high velocity into the burner tile structure. The stream of fuel is deflected. The high temperature combustion gas is induced from the combustion space to the burner tile structure by the specific effect of high velocity stream of fuel. This high temperature combustion gas is diffused in the stream of fuel so that the fuel is gasified before combustion. The NOx generating rate is reduced by half and at the same time uniform and low temperature complete combustion is attained with considerably reduced excess air. (Author summary modified)

58560

APTIC NO. 83219

Hisano, Masaya

HYDRODESULFURIZATION DISPOSAL METHOD OF CRUDE OIL. (Genyu no suisokadatsuryu shori hoho). Text in Japanese. (Chiyoda Chemical Engineering and Construction Co., Ltd. (Japan)) Japan. Pat. Sho 50-37043. 3p., Nov. 29, 1975. (Appl. May 27, 1972, 2 claims).

An economical separation/desulfurization method for crude oil for oil refining is described. Crude oil is mixed with hydrogen and separated through a high temperature, high pressure separator into heavy and light hydrocarbon oil. The separated light hydrocarbon oil is then hydrodesulfurized. The crude oil is pressurized up to 10-70 kg/cu cm G, then mixed with pure hydrogen at a rate of 25-200 N cu m/cu m of crude oil, and the crude oil/hydrogen mixture is heated to 250-380 C. The heavy hydrocarbon oil separated through the high temperature/pressure separator is re-pressurized to 40-150 kg/cu m G to supplement the insufficient pressure, and mixed with 300-1100 N cubic m/cu m heavy hydrocarbon oil of additional pure hydrogen for hydrodesulfurization. Only slight temperature control is provided if necessary for the hydrodesulfurization of the prepared heavy hydrocarbon oil. The characteristics of the new process are the achievement of a separation efficiency comparable to conventional methods, a single process for hydrodesulfurization of light hydrocarbon oil and simplified preparation for hydrodesulfurization of heavy hydrocarbon oil.

58561

APTIC NO. 83802

Hishida, Kazuo

TECHNICAL COUNTERMEASURES TO MEET THE TOTAL AMOUNT REGULATION OF NOX. (Nox soryo kisei ni taio suru gijyutsuteki taisaku). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(6):33-47, June 1975. 7 refs.

General techniques for preventing atmospheric pollution, the relation between the intensity of nitrogen oxides discharge and the concentration of NOx in the atmosphere, NOx emission standards, the amount of NOx to be decreased, the necessity for the use of better fuels, suppression of NOx discharge by the improvement of combustion techniques, and the effect of NOx removal from discharged gases are discussed. Some oils contain a large amount of nitrogen compounds. For example, Iranian heavy oil collected in Iran contain as much as 0.226% nitrogen, which is converted to NOx upon combustion, whereas the oil produced in Abadavi contain only 0.028% nitrogen by weight. Various techniques have been developed to reduce NOx discharge from boilers. The reduction of heat load in the combustion chamber is effective because low-temperature burning yields less NOx formation. A reduction of excess oxygen or air is also effective. The improvement of the method of combustion is important. Two-stage combustion,

recirculation of discharged gas, tangential combustion, off-stoichiometric combustion, and the ejection of water or steam are now commonly used. Burners with low-NOx production are commercially available.

58562

APTIC NO. 81847

Hodges, James L.

THE EFFECT OF EXHAUST RECYCLE ON KNOCK-LIMITED SI ENGINE PERFORMANCE. Preprint, Society of Automotive Engineers, Warrendale, Pa., 7p., 1975. 14 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750025.)

The effectiveness of exhaust gas recycle as a knock suppressant in spark ignition engines was assessed using a single cylinder variable compression ratio engine and two different fuels. A higher knock-limited compression ratio with the engine operating near stoichiometric on 80 octane (American Society for Testing and Materials) fuel resulted in a brake mean effective pressure which was constant for moderate recycle, falling only with high recycle rates. Brake specific fuel consumption decreased with recycle to a minimum and then increased for higher recycle rates. Brake specific fuel consumption increased steadily with recycle for lean mixtures, however. Performance with isoctane fuel was similar. The maximum nitric oxide concentration with 80 octane fuel was about 1800 ppm with 10% recycle and occurred at a fuel-air equivalence ratio of about 0.9. Nitric oxide emissions with isoctane fuel were similar at 10% recycle. (Author abstract modified)

58563

APTIC NO. 76437

Hoehn, F. W., R. L. Baisley, and M. W. Dowdy

ADVANCES IN ULTRALEAN COMBUSTION TECHNOLOGY USING HYDROGEN-ENRICHED GASOLINE. Preprint, California Inst. of Tech., Pasadena, Jet Propulsion Lab., 10p., 1975. 5 refs. (Presented at the Intersociety Energy Conversion Engineering Conference, 10th, Newark, Del., Aug. 17-22, 1975.)

Exhaust emissions and performance data for a full-sized passenger vehicle which is modified for ultralean combustion using hydrogen-enriched gasoline to meet the 1976 federal emission standards are presented. Hydrocarbon, carbon monoxide, and nitrogen oxide emissions from a bottled gas vehicle equipped with an exhaust converter are 0.39, 0.04, and 0.35 g/mi, respectively, as measured over the Federal Test Procedure. A 25% decrease in total energy consumption relative to the baseline stock gasoline vehicle is also achieved with the ultralean hydrogen-enriched combustion. Hydrogen can be delivered to the engine either from a bottled storage system or from a partial oxidation reaction generator. Post-test inspections of the engine parts and induction system do not reveal any adverse affects from the fuel mixture.

58564

APTIC NO. 82654

Hofbauer, Peter

DISCHARGE ARRANGEMENT FOR THE EXHAUST GAS FROM THE WORK AREA OF A ROTARY PISTON COMBUSTION ENGINE. (Volkswagenwerk Aktiengesellschaft, Wolfsburg (Federal Republic of Germany)) U. S. Pat. 3,883,276. 9p., May 13, 1975. 8 refs. (Appl. May 9, 1974. 6 claims).

A discharge arrangement for the exhaust gas from the work areas of a rotary piston combustion engine is described. The combustion engine has a circular piston arrangement, an internal axle, a camming contact in which the piston is mounted on an eccentric shaft and rotates in a housing comprising at least a pair of side members and a central member. The latter consists of outer portion defining a curved internal space and sealing means describing a predetermined curve during rotation. In this arrangement, the four-cycle process is satisfactorily per-

formed without any major construction provisions. This is an improvement over other engines

58565

APTIC NO. 82978

Holland, Robert F. and Adrian J. Peterson

FILTER-SEPARATOR APPARATUS. (Black, Sivalis and Bryson, Inc., Houston, Tex.) U. S. Pat. 3,888,644. 6p., June 10, 1975. 8 refs. (Appl. Dec. 3, 1973, 8 claims).

An improved filter-separator apparatus for removing solids and entrained liquids from a gas stream is described. The apparatus includes a horizontal vessel with partitions which divide the vessel into three compartments. A gas stream inlet connection is connected to the vessel opening into the second compartment and a conduit is located within the second compartment sealingly attached to openings in the partitions so that the first and third compartments communicate with each other by way of the conduit. First and second filters are located within the second compartment connected through the partitions. A gas stream entering the vessel by way of the gas stream inlet connection is split within the second compartment. One part passes through the first filter into the first compartment, through the conduit and into the third compartment. The other part flows through the second filter directly into the third compartment. A gas stream outlet connection is connected to the vessel which opens into the third compartment. Liquid coalescing means are located within the third compartment so that the recombined gas stream flows through the liquid coalescing means and is withdrawn by way of the outlet connection. This apparatus is relatively small and economical as compared to prior apparatus for removing solids and entrained liquids from gas streams of high flow rates and/or pressures. (Author abstract modified)

58566

APTIC NO. 82662

Hollis, Thomas J., Jr.

PRESSURE TRANSDUCER AND EXHAUST GAS RECIRCULATION CONTROL VALVE USING SAME. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,880,129. 8p., April 29, 1975. 5 refs. (Appl. Oct. 31, 1973, 5 claims).

A novel valve assembly was developed which utilizes the exhaust back pressure to recirculate exhaust gases at a rate proportional to air flow and in a manner which avoids recirculation of exhaust gases through the carburetor. An exhaust gas recirculated passage is provided which extends from the engine exhaust passage to the engine air induction passage at a point downstream of the engine throttle. An orifice is provided in the recirculation passage, and a valve disposed downstream of the orifice is operated to create a zone of substantially constant pressure in the passage irrespective of the wide variations in exhaust back pressure and induction passage vacuum. The rate of recirculation of exhaust gases through the zone is proportional to the rate of induction air flow. In other valve assemblies, the diaphragm responsive to back pressure has directly operated the valve pintle to control the flow of exhaust gases. These have certain limitations because the back pressure generally is very low.

58567

APTIC NO. 82673

Honiden, Yoshinori

FUEL INJECTION TYPE ROTARY PISTON ENGINE. (Toyo Kogyo Co., Ltd., Hiroshima (Japan)) U. S. Pat. 3,882,828. 5p., May 13, 1975. 3 refs. (Appl. Sept. 27, 1973, 10 claims).

A fuel injection type rotary piston engine was developed which has an intake port, a fuel injection nozzle, and an auxiliary air port. The intake port is provided on at least one of the side housings for introducing fresh air into the working chamber of the rotary engine. The fuel injection nozzle is provided on the rotor housing for injecting fuel into the working chamber in such a direction that the auxiliary air flow intersects the injected fuel stream. Disadvantages of known en-

gines are eliminated by providing a means for facilitating atomization of fuel injected into the working chamber of the engine during low speed operation and a means for introducing air flow in such a direction that it intersects the flow of fuel injected into the working chamber of the engine. (Author abstract modified)

58568

APTIC NO. 82327

Honig, Gunther and Uwe Kiencke

CONTROL SYSTEM AND DEVICES FOR INTERNAL COMBUSTION ENGINES. (Robert Bosch G.m.b.H., Gerlingen-Schillerhohe (Federal Republic of Germany)) U. S. Pat. 3,898,962. 46p., Aug. 12, 1975. 7 refs. (Appl. May 31, 1973, 115 claims).

A control device for a fuel injection system of an internal combustion engine having a computing circuit is described. An air flow meter is arranged in the induction pipe of the engine which has an output providing signals in digital form, for example by controlling the frequency of an oscillator which is then converted into digital signals by a frequency/digital converter. The digital signals are applied to a computing circuit which simulates the operating characteristics of the internal combustion engine. The design of the control device enables the exhaust gases to be relatively uncontaminated with obnoxious substances, since the simulation leads to optimum combustion of the air/fuel mixture. The cleanliness of the exhaust gases is improved if an oxygen measuring sensor is arranged in an exhaust gas collecting manifold of the engine. (Author abstract modified)

58569

APTIC NO. 82193

Honnen, Lewis R.

HYDROCARBYLAMINE ADDITIVES FOR DISTILLATE FUELS. (Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,898,056. 10p., Aug. 5, 1975. 2 refs. (Appl. Oct. 11, 1973, 19 claims).

A gasoline additive for inhibiting and removing deposits in internal combustion engines which lead to increased levels of hydrocarbons and carbon monoxide in the exhaust is described. The additive exhibits a broad range of detergency and may be employed at low concentrations without the usual loss in effectiveness associated with conventional detergents. The additive consists of a mixture of high and low molecular weight hydrocarbyl amines. The high molecular weight hydrocarbyl amine contains at least one hydrocarbyl group having a molecular weight between 1900 and 5000, and the low molecular weight hydrocarbyl amine contains at least one hydrocarbyl group having a molecular weight between 300 and 600. The weight ratio of the low molecular weight amine to the high molecular weight amine in the mixture is maintained between about 0.5 and 5:1. (Author abstract modified)

58570

APTIC NO. 82674

Horie, Masakazu, Takao Fukuhara, and Tetuya Harada

EXHAUST GAS RECIRCULATION CONTROL DEVICE FOR INTERNAL COMBUSTION. (Nissan Motor Co. Ltd., Yokoyama City (Japan)) U. S. Pat. 3,882,837. 5p., May 13, 1975. 5 refs. (Appl. March 1, 1973, 3 claims).

A flow control device for use in an exhaust gas recirculation system of an internal combustion engine is described. Unlike other devices, it is adapted to control the amount of engine exhaust gases recirculated to an intake manifold of the engine in a manner optimum for reducing toxic nitrogen oxides contained in the engine exhaust gases without impairing engine operation. The device consists of an exhaust gas recirculation passage, a flow control valve located in the exhaust gas recirculation passage, and responsive to the position of a carburetor throttle valve of the engine, and a flow restricting means located in the exhaust gas recirculation passage in series with the flow control valve. The flow restricting means includes another flow control valve responsive to a signal indicative of the cold or light load operating conditions of the engine. (Author abstract modified)

58571

APTIC NO. 82280

Horikagao, Hideaki

PRACTICAL EXAMPLE OF DESULFURIZATION AND DENITRIFICATION BY $\text{ClO}_2\text{-Na}_2\text{SO}_3$ METHOD.(ClO₂-Na₂SO₃ ho ni yoru datsuryo dassho no jutsurei). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(9):65, Sept. 1975.

The simultaneous desulfurization and denitrification of flue gas by the chlorine peroxide-sodium sulfite method developed by the Fujikasui Industrial Co. is described. The process includes a chlorine dioxide generation facility in which ClO_2 gas is generated from the reaction between sodium sulfite and sulfuric acid. The ClO_2 serves to oxidize nitric oxide to nitrogen dioxide, with 100% of the oxidation reaction completed in 0.3 sec. The specificity of ClO_2 oxidation for NO is high, and the reaction of ClO_2 with sulfur dioxide and carbon monoxide is negligible. The required ClO_2 is 0.5 the number of moles of the NO in the flue gas, at which 100% oxidation of NO is obtainable. In the absorption tower, SO_2 is first absorbed by a sodium hydroxide solution to form sodium sulfite, which reacts with NO_2 to produce nitrogen gas and sodium sulfate. Calcium sulfate could be used instead of sodium sulfite, however, the desulfurization-denitrification efficiency is poorer with the calcium salt. Presently the process is applied at three different locations to treat the flue gases from boilers and heating furnaces; their flue gas emission rates range from 10,000 to 100,150 N cu m/hr, with SO_x concentrations up to 1400 ppm and NO_x concentrations up to 250 ppm. The desulfurization efficiency obtained in these facilities is 93 to 99%, while the denitrification efficiency is 88 to 90%.

58572

APTIC NO. 83134

Horvath, Zoltan

ENVIRONMENTAL PROTECTION IN METALLURGY.

(Kornyeztvedelem a fémkohasztatban). Text in Hungarian. Banyasz. Kohasz. Lapok - Kohaszat, 108(7):321-325, July 1975. 17 refs.

Sulfur dioxide and fluorine emissions generated in copper, zinc, and lead metallurgy, and methods for their abatement are described. The sulfur dioxide emissions, originating from the ore sulfur content and from sulfur-containing fuels, can be abated by technological improvements, such as reduction of the flue gas volume with high SO_2 concentration; the Kivcet, Wocra, Norand, and Mitsubishi processes; and the wet processes which totally eliminate the emission problems. The SO_2 -containing flue gases are treated mostly with ammonium hydroxide, sodium hydroxide, or calcium hydroxide for SO_2 removal, as exemplified by many new flue gas treatment units at leading metallurgical companies. These measures, including the construction of high stacks, permit at least 95% of the SO_2 to be removed from the flue gases. Fluorine, for which the specific emission with respect to aluminum works is limited to 1 kg/ton of aluminum in the USA, France and other countries, can be abated by improved technological processes or flue gas treatment, consisting of scrubbing with acid, alkaline solution or water, or by adsorption on alumina in a dry fluidized-bed process.

58573

APTIC NO. 82039

Horwinski, Elwood R.

LOW OR ZERO POLLUTION HYBRID ENERGY CONVERTER AND TRANSMISSION UNIT.

(Products, Inc., Cheshire, Conn.) U. S. Pat 3,904,883. 7p., Sept. 9, 1975. 3 refs. (Appl. June 22, 1973, 9 claims).

A hybrid energy converter for driving a vehicle for some stationary source is described that requires less heavy motive or power equipment than prior art designs. The unit involves a dynamo-electric machine with a commutator-type armature and a salient-field type rotor surrounding and carrying the armature. The armature shaft is coupled to drive a load such as vehicle wheels, for example; and the rotor is coupled to a prime mover such as a gasoline or steam engine. Storage batte-

ries are connected to drive the dynamo-electric machine as a series motor and can be recharged by a shunt generator portion of the unit when the armature of the latter is being driven by the prime mover or gasoline engine. (Author abstract modified)

58574

APTIC NO. 79757

Hoshiro, Tamotsu

ON DUST COLLECTION AT FOUNDRIES. (Imono kojo no shujin ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(9):780-794, Sept. 1975. 5 refs.

Dust particulate sizes in foundries range from 0.5-300 micron. About 10-20% of the particulates have diameters below 10 micron, and must be captured at the source. Dust concentrations can be reduced from 38,400/cc to 1300/cc at the belt conveyor scraper. Proper fan and hood design and installation are necessary, as well as proper speeds of operation. For a mixer with an enclosed hood, the rate of wind supply should be 28 cu m/min, but for mixer with a rotating pan, wind velocity at the opening should be 45 m/min. Dust collection ducts should be capable of maintaining internal wind velocities of 1080 m/min; other ducts should maintain internal wind velocities of 600 m/min. There must be compensation for pressure loss occurring in ducts and hoods. Almost universally, bag filters are used to collect the dust from foundries. Secondary pollution, which can occur when bag filters are being disposed, must be eliminated. Data on design and efficiency are included.

58575

APTIC NO. 80317

Hosoi, T. and H. G. Keister

ETHYLENE FROM CRUDE OIL. Chem. Eng. Progr., 71(11):63-67, Nov. 1975. 2 refs.

A technology for cracking sour crude oils to an optimum ethylene yield that is economically superior to conventional naphtha-gas oil cracking was developed. The superheated steam is generated by the burning of oxygen and fuel to produce combustion gases of about 2000 C. This is supplemented by superheated steam generated externally from the reaction zone. The steam and reaction product are rapidly quenched and cooled. A gas liquid phase separation takes place in the disengaging pot, pitch is discharged and the vapor goes to the gasoline fractionator. The gas is compressed, cooled, and processed in a modified alkanolamine acid gas absorption system to remove the carbon dioxide and hydrogen sulfide. The sweet gas is processed through a separator train to recover ethylene, acetylene, and the other cracking by-products.

58576

APTIC NO. 79837

Houseman, John, L. F. Molinari, and M. W. Dowdy

LEAN COMBUSTION OF HYDROGEN/GASOLINE MIXTURES. Am. Chem. Soc. Div. Petrol. Chem. Preprints, 20(1):127-140, Feb. 1975. 11 refs. (Presented at the Chemistry of Combustion in Engines Symposium, Philadelphia, Pa., April 6-11, 1975.)

The results of Comparative Fuels Research engine experiments with hydrogen/gasoline mixtures are presented and compared with the predictions from a theoretical engine performance model. Experimental results on the lean flammability limit of hydrogen/methane mixtures in an atmospheric porous plate burner are also presented. Le Chatelier's rule for predicting the lean flammability limit of mixed fuels yielded answers within 10% of the experimental data for mixtures of hydrogen and methane. The lean limits of hydrogen and methane are not appreciably affected by nitrogen dilution. The model predicts and the data confirm that the 0.4 g/mile nitrogen oxides standard can be met by operating at an equivalence ratio of 0.5. Operation at an equivalence ratio of 0.5 can be achieved by adding 4% hydrogen by weight to the gasoline. The CFR indicated thermal efficiency was 38% with 4% hydrogen enrichment and at an equivalence ratio of 0.5. This compares

with an efficiency of 27% at an equivalence ratio of 1.0 with gasoline only and represents an increase in fuel economy of 40%. Operation at the lean limit of gasoline at an equivalence ratio of 0.6 produced an efficiency of 34%. This corresponds to a 25% increase in efficiency over operation at an equivalence ratio of 1.0. The hydrocarbon emissions are considerably above the 0.41 g/mi standard at an equivalence ratio of 0.5 with 4% hydrogen enrichment. The hydrogen enriched gasoline concept provides a potential solution to both the 1978 emission standards and improved fuel economy, provided the hydrocarbon emissions can be reduced. (Author abstract modified)

58577

APTIC NO. 82994

Houston, Reagan

REGENERATIVE INCINERATOR SYSTEMS FOR WASTE GASES. (Assignee not given.) U. S. Pat. 3,870,474. 9p., March 11, 1975. 4 refs. (Appl. Nov. 13, 1972, 20 claims).

Various regenerative incinerator systems for purging regenerative incinerators of odorous or untreated air prior to discharge of any air into the atmosphere are described. In conventional systems when the air flow is reversed every few minutes, the untreated air which just entered one of the regenerators prior to the flow reversal is expelled without passing entirely through the regenerators, thus allowing untreated or partly treated air to be expelled into the atmosphere. The system includes three regenerators, thus permitting any two of the regenerators to be in operation at any one time while the third regenerator receives a small purge of treated or purified air to force out any untreated or contaminated air from the third generator and discharge into a combustion chamber. The contaminants are oxidized and the purged air is mixed with the main air flow for discharge from the system with the main air flow. Alternatively, a small amount of hot and purified air from the combustion chamber may be caused to flow through the regenerator to be purged and through a blower which mixes the purged air with the incoming contaminated air for recirculation through the system. (Author summary modified)

58578

APTIC NO. 84408

Howard, F. Sidney

STATEMENT: HAZARDOUS WASTE MANAGEMENT. Preprint, Environmental Protection Agency, Washington, D. C., 24p., 1975. 6 refs. (Presented at the Hazardous Waste Management Meeting, Dec. 11, 1975.)

The environmental advantages of multiple hearth furnaces for the control and detoxification of wastes are described. The units meet the new air quality standards under the Clean Air Act. Their exhaust gases have an insignificant impact on air quality. Use of proper emission controls and proper operation of the incineration system enable a facility to meet all existing particulate matter regulations. Most potentially hazardous and hazardous metals are not significantly found in the stack gases, but are converted to oxides in the incineration process and consequently removed either as particulates by the scrubbers or in the ash. Lime is recovered and carbon dioxide is recycled during the normal operating procedures in advanced chemical treatment plants. Latest developments on the decomposition of polychlorinated biphenyls in multiple hearth furnaces are included.

58579

APTIC NO. 82937

Howell, Brooks Mason

STACK GAS REHEATING FOR FLUE GAS SCRUBBING SYSTEM. (Combustion Engineering, Inc., Windsor, Conn.) U. S. Pat. 3,880,622. 5p., April 29, 1975. 9 refs. (Appl. Nov. 23, 1973, 8 claims).

A process for reheating stack gas in a flue gas scrubbing system is described. The process includes a wet scrubber and means for heating the moisture laden gases emerging from the scrubber for drying purposes and for preventing the occurrence

of a steam plume at the gas discharge stack. The moist gases heated by intermixture with a recirculated portion of dry, previously processed gas whose temperature is raised by passing it through a heat exchanger disposed in the recirculation line. By means of this arrangement the heat transfer surface of the heat exchanger is physically removed from the moist gas stream and is itself contacted only by dry gas. Because the moist gas stream does not impinge on the heat transfer surfaces of the heat exchanger these surfaces are protected against the possibility of undue scaling and corrosion that is present in other systems caused by the precipitation of the elements entrained in the moisture laden gases. (Author summary modified)

58580

APTIC NO. 83308

Hsu, Yuan Tsun and K. Robert Lange

METHOD FOR SCRUBBING GASES DERIVED FROM BASIC OXYGEN FURNACES. (Bezt Labs., Inc., Trevoise, Pa.) U. S. Pat. 3,857,340. 5p., June 3, 1975. 1 ref. (Appl. Aug. 29, 1974, 7 claims).

A method of scrubbing waste flue gases derived from basic oxygen furnace steel producing operations is described. The flue gases are sprayed with an aqueous medium containing a substantially linear water soluble sulfonated polystyrene and an organo phosphonic acid derivative in a weight ratio basis of 1:10 to 10:1. The acid has the structural formula (X) (subscript 2)--R--N(X)(subscript 2), where R is a lower alkyl of from 1-7 carbon atoms, X is hydrogen or the group CH₂PO₃M₂, where M is a water soluble cation. At least one, but preferably all X's, are CH₂PO₃M₂. In certain instances it is desirable to use a water soluble lignosulfonate in addition to the aqueous medium. (Author abstract modified)

58581

APTIC NO. 82403

Huang, A. Ben and Arnold L. Ducoffe

ELECTROSTATIC PRECIPITATING METHOD. (Assignee not given.) U. S. Pat. 3,907,520. 12p., Sept. 23, 1975. 12 refs. (Appl. Oct. 11, 1973, 7 claims).

An electrostatic precipitating method is described which includes moving a gas stream with entrained charged particles along a prescribed path and imposing an electrostatic force field on the charged particles with a first component of force exerted on the particles opposite to their direction of movement to slow them down and a second component of force exerted on the particles generally normal to the path of movement of the particles to separate them from the gas stream. The particles are separated without collecting them on the primary-field producing-grids, so that operation is continuous. The invention creates minimum back pressure in the stream to minimize the power required to force the gas stream through the invention. Also, because the particles are not collected on the grids within the gas stream the electrical field generating power is maintained at a minimum. The apparatus includes a duct through which the gas stream is forced, means for charging the particulate matter in the gas stream, and means for separating the charged particulate matter from the gas stream. Means may be provided for converting gaseous pollutants into particulate pollutants for separation. One embodiment of the separating means includes an entry grid with a charge of opposite polarity to the charge on the particulate matter and an exit grid downstream of the entry grid with a charge of like polarity to the charge on the particulate matter. Additional exit grids may be added downstream of the entry grid, and charged with the same polarity as the particles. Each exit grid has a higher potential than the next upstream grid, to generate an electrostatic force field between each pair of adjacent grids that imposes a force on the charged particles contrary to the direction of gas flow. (Author abstract modified)

58582

APTIC NO. 80266

Huang, C. J., Charles Dalton, George Edward Antunes, Ronald Lad Carmichael, Tsong-how Chang, Shang-I Cheng, Gary Max Halter, Joel Joseph Hebert, Francis Wilford

Holm, Edwin Carl Kettenbrink, Jr., James Lowell Kuester, Loren Daniel Lutes, Dupree Maples, Arthur Christian Meyers, Shankaranarayana R. N. Rao, Armando Riesco, II, Fredrick Wallace Swift, Michael L. Steib, William Danny Turner, Lambert John Van Poolen, and Henry Allen Wiebe
ENERGY RECOVERY FROM SOLID WASTE (VOLUME I) (SUMMARY REPORT). Houston Univ., Tex., National Aeronautics and Space Administration Contract NGT-44-005-114, Rept. NASA Cr-2525, 27p., April 1975. 64 refs.

The solid waste considered consists of mixed municipal refuse. The social, legal, environmental, and political factors are considered with recommendations made in regard to new legislation and policy. Biodegradation and thermal decomposition are the two areas of disposal that are considered with emphasis on thermal decomposition. A technical and economic evaluation of a number of available and developing energy-recovery processes is given. Based on present technical capabilities, use of prepared solid waste as a fuel supplemental to coal is the most economic process by which to recover energy from solid waste. Markets are considered with suggestions given for improving market stability. A decision procedure is given to aid a community in deciding on its options in dealing with solid waste. (Author abstract modified)

58583

APTIC NO. 76602

Huch, Reinhold

SPECIAL METHODS FOR THE REDUCTION OF EMISSIONS. (Spezielle Verfahren der Emissionsminderung). Text in German. Staub, Reinhaltung Luft, 35(10):362-366, 1975. 6 refs.

Measures for controlling odorous exhaust gas are discussed. Economic considerations limit the practicality of combustion measures that go beyond the usual filtering and adsorption purification of the gases. Alterations in the design and operation of plants, variations in exhaust purification systems involving combined washing and chemical oxidation, adsorption and combustion, or adsorption and biological oxidation are discussed.

58584

APTIC NO. 83218

Huebler, W.

SYNTHETICS HELP TO SOLVE ENVIRONMENTAL PROBLEMS. (Kunststoffe helfen Umweltprobleme loesen). Text in German. Chem. Ind. (Duesseldorf), 27(9):516-520, 1975.

The applications of plastics, especially polyethylene, polyvinylchloride, fiberglass and polystyrene in air and water pollution control and in insulation are discussed. For example, plastics are used in making absorber, scrubber, and cooling towers and their packings. Plastic or plastic coated steel pipes and tanks are common in wastewater treatment systems and in oil storage installations, as plastics are corrosion resistant. Plastic coated aerator blades are also used in wastewater treatment. Expanded polystyrene foams are being used to insulate buildings against heat loss and noise.

58585

APTIC NO. 82431

Humiston, Gerald Francis and Barton Lester Cotton

ROTARY INTERNAL COMBUSTION ENGINE. (Pollution Control, Inc., South Barre, Vt.) U. S. Pat. 3,897,758. 9p., Aug. 5, 1975. 8 refs. (Appl. July 8, 1974, 3 claims).

A novel and improved rotary positive displacement engine is described which utilizes approximately 90% of piston travel on power strokes. This increases the effective displacement for a given piston size and travel. The engine consists of a housing having an open chamber formed within it. Fuel is injected into the chamber and exhaust products leave from it. Valves are movably mounted in the housing in juxtaposed relation to the open chamber. The valve intermittently move into the chamber and divide it into plurality of closed sections. A disc is located on the shaft which is supported in the housing for rotation. Pistons are located on the disc in spaced relation

relative to each other. They extend into the chamber and rotate as the disc is caused to rotate. The shaft is driven by the pressure of the gases in the plurality of closed sections, generated by the ignition of the fuel injected through the intake into the open chamber, acting upon the plurality of pistons. This engine has a substantially smaller number of moving parts than commonly found in a positive displacement engine. (Author abstract modified)

58586

APTIC NO. 82856

Hunt, David H., Raymond J. Allain, and Joseph E. Maselek

APPARATUS FOR FILTERING PARTICULATE MATTER FROM GAS AND HAVING REVERSE FLOW CLEANING MEANS. (The Spencer Turbine Co., West Hartford, Conn.) U. S. Pat. 3,874,857. 6p., April 1, 1975. 9 refs. (Appl. Jan. 7, 1974, 7 claims).

An apparatus for filtering dust particles from air is described. It consists of a plurality of flexible tubular shaped gas permeable filter elements through which dust laden air is constrained to pass in flowing through the apparatus. Each filter element has a clean air outlet opening from which filtered air is withdrawn and a frustoconical diffuser is located outside the opening. High velocity streams of air are evenly distributed over the surface of the diffuser and enter the filter element and flow therethrough in a controlled manner and in a direction counter to the direction of filtered air flow therefrom. In other systems providing reverse gas flow, the cleansing efficiency of the gas pulse is significantly affected by its configuration as it enters the filter element and travels along the inner surface thereof. (Author abstract modified)

58587

APTIC NO. 80470

Hunter, J.

PNEUMATIC TRANSPORTATION OF COAL AND ASH IN INDUSTRIAL BOILER PLANT-EXPERIENCE WITH A PROTOTYPE PROGRAMME-CONTROLLED SYSTEM. Proc. Inst. Mech. Engrs. (London), 189(10):29-43, 1975. 4 refs. (Presented at the Institution of Mechanical Engineers, London, England, April 30, 1975.)

A prototype program-controlled system for the transportation of coal and ash in an industrial boiler plant was developed. The system is fitted to two 905 kg/hr steam boilers at a mine in Fife and has run for 2 yr. It consists of a pneumatic system for conveying coal, automatically, from the coal store to the main boiler hopper and an integral system for conveying ash away from the boilers. The plant is described in detail including experience in operation and reports on the results of tests on fuel degradation, pressure loss and air-flow measurements, performance of the coal and ash handling sections, plant wear, and electrical costs. The average exhaust emission is 0.344 g/cu m which is well within the limits laid down for chimney emissions in the Clean Air Act. (Author abstract modified)

58588

APTIC NO. 82909

Hunter, Joseph E., Jr.

CATALYTIC CONVERTER. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,874,854. 5p., April 1, 1975. 13 refs. (Appl. Feb. 1, 1973, 3 claims).

A catalytic converter is described in which the catalytic element is maintained at an elevated temperature for prolonged periods of time following cessation of converter operation. It contains a fusible material operative to absorb a portion of the sensible heat of the treated exhaust gases during periods of converter operation and to release the absorbed heat to the catalytic element during periods of non-operation, thereby serving to maintain the temperature of the catalyst above its activation temperature for prolonged periods of non-operation. This minimizes the warm-up period operation which reduces exhaust emissions.

58589

APTIC NO. 81946

Hyman, M. H. and F. L. Pizzimenti

PRACTICAL INNOVATIONS IN PARTICULATE EMISSIONS ABATEMENT. Preprint, American Chemical Society, Washington, D. C., 8p., 1975. 3 refs. (Presented at the American Chemical Society, Meeting, Chicago, Ill., Aug. 27, 1975.)

Major particulate emission problems in the production of phosphate fertilizers occur in phosphoric acid and solids formation operations. The problems are compounded by scaling, corrosion, and caking tendencies. Practical solutions have been developed. Conventional scrubbers which have plugged have been redesigned and fog plumes eliminated. Control of fuming from fired equipment has been vastly improved by rearrangement of equipment internals and process system modifications. Control of dust and alleviation of caking problems with material handling facilities can sometimes be achieved through utilization of specially designed equipment such as conveyors and new concepts in building design. Methods of particulate emissions abatement permitting dry product recovery have replaced scrubbers. The design of abatement equipment can now be safely accomplished to meet Ringelmann opacity limitations from an improved grain loading correlation. (Author abstract)

58596

APTIC NO. 83650

Iinuma, Kazuo

SUPPRESSION OF POLLUTION BY ENGINES AND COMBUSTION. (1). GASOLINE ENGINE. (*Engine no tei osenka to nensho. (1). Gasolin engine*). Text in Japanese. Preprint, Fuel Society, Combustion Section, p 15-28, 1975. 12 refs. (Presented at the Combustion Method New Engines Seminar, Tokyo, Japan, June 9-10, 1975.)

The combustion processes of spark ignition engines are discussed. The mechanism of formation of pollutants, the relation between the amount of exhausted pollutants and the operating conditions of engines, and countermeasures against pollution are described. The mechanisms of ignition and flame propagation and the combustion processes are explained by simulation. The equilibrium composition of exhaust gases and the mechanisms of formation of hydrocarbons and nitrogen oxides are discussed. The effect of the air-fuel ratio, the effect of ignition timing and the effects of various driving conditions and the dimensions of engines are explained. Two-stroke engines and rotary piston engines are discussed. Countermeasures against atmospheric pollution include the modification of engines, exhaust gas recirculation, multi-layer combustion, and the installation of a thermal reactor or a catalytic converter. Emphasis is placed on methods that are feasible in the near future.

58591

APTIC NO. 84148

Ikeda, Soroku

ON THE STACK GAS DESULFURIZATION FACILITIES AT THE THERMAL POWER STATION. (*Sekitan karyoku hatsudensho no haien datsuryu sochi ni tsuite*). Text in Japanese. Dengen Kaihatsu Chosa Shiryo (Res. Bull. Electr. Power Develop. Co., Ltd.), no. 55:28-46, Sept. 1975.

The pollution fighting effort of Dengen Kaihatsu Co., Ltd. is seen in the stack gas desulfurization facilities installed or being installed at four coal fired steam power plants, in which the pollution prevention policy for sulfur oxide extends to both fuel control and facility control in response to the stricter regulations. The first unit assembled at the Takasago Steam Power Plant is a 250 MW wet type lime/gypsum method stack gas desulfurization device with a gas disposal capacity of 840,000 N cu m/hr. This unit is the first of its kind in Japan which can treat the total volume of exhaust gas emitted from a plant or process, and has been operating since February 1975. A summary and the characteristics of the unit are described. The desulfurization rate was 89.6%, and the concentration of

AIR POLLUTION ABSTRACTS, JUNE 1976

dust at the inlet was 0.081 g/N cu m and 0.017 g/N cu m at the outlet during the first two months of the test run.

58592

APTIC NO. 80345

Imai, Yuichi and Osami Mori

ENVIRONMENTAL POLLUTION IN SURFACE FINISHING INDUSTRIES AND A VIEW OF CONTROL TECHNOLOGY. (*Hyomen shori kogyo ni okeru kogai to sono bojo gijutsu no tenbo*). Text in Japanese. Kinzoku Hyomen Gijutsu (J. Metal Finish.), 26(11):528-533, Nov. 1975. 10 refs.

The progress of pollution control in the surface-finishing industries is surveyed. Pollution control technology has been a development of the last 20 years, and has accompanied expansion of pollution control regulations. Even in 1970, pollution control regulations lacked teeth for dealing effectively with cyanide contamination of well water in Tokyo by plating factories. Surface-finishing industries emit toxic pollutants in the form of dust, organic solvents, cyanide gas, ammonium chloride, hydrogen chloride, and heavy metals. Recently, sealing pollutants in concrete blocks has been encouraged as a regulatory measure, but there are problems in implementation. Waste waters are being treated by ion-exchange resins and concentration-recovery methods. Plating procedures have been revised to reduce pollutant formation and spread. Bag filters are used to collect airborne pollutants. Working with closed systems, while wearing protective masks, is another method of containing dust, while protecting the worker. There is a practical limit to the recovery of waste products for further use. Continuous monitoring and analysis of processes is a necessity for developing effective pollution control.

58593

APTIC NO. 82488

Imazumi, Kenichi and Masanobu Yoshika

EXHAUST PORT OF A ROTARY PISTON ENGINE. (*Toyota Jidosha Kogyo Kabushiki Kaisha (Japan)*) U. S. Pat. 3,894,819. 5p., July 15, 1975. 1 ref. (Appl. Dec. 20, 1973, 6 claims).

An improved structure of the exhaust port of a rotary piston engine is described. The noise due to the abrupt opening and closing of the exhaust port is attenuated by smoothing the exhaust operation, even by employing only one port. Conventional systems use a plurality of port in parallel arrangement. This complicates the engine structure, especially when air injection into the exhaust port is performed for the purpose of cleaning the exhaust gases. The exhaust port is at the wall of the center housing and is adapted to be controlled in its opening and closing by being traversed by the apexes of the rotor.

58594

APTIC NO. 79779

Inaba, S.

STACK GAS DENITRIFICATION PLANT OF HITACHI SHIPBUILDING AND ENGINEERING CO., LTD. (*Hitachi zosen no haien dasho puranto*). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(9):35-39, 1975.

Descriptions of various types of denitrification system developed by Hitachi are given. A selective catalytic reduction method using ammonia as the reducing agent was selected above other methods for development. A series of non-selective, semi-selective and selective reduction denitrification systems were developed and tested at pilot plants between April 1973 and May 1975. Reduction catalysts suitable to each system were also developed. The characteristics of Hitachi denitrification systems are: applicability to dirty gas containing sulfur oxides as well as clean gas; avoidance of catalyst clogging by dust in the flue gas; the use of specially designed equipment for preventing clogging by other particulates; and the possibility of using carbon monoxide, hydrogen, and hydrocarbons as reducing agents. Problems of catalyst clogging, catalyst poisoning, and high reaction temperature, and countermeasures for these problems are also discussed. Examples of denitrification systems and combined denitrifica-

CONTROL METHODS

58601

tion and desulfurization systems are given with specifications and equipment and operating cost estimates.

58595

APTIC NO. 83728

Inagaki, Sueharu

A CASE OF ELECTROSTATIC PRECIPITATOR APPLICATION. (*Denki shujin sochi riyo no jissai*). Text in Japanese. *Nenryo Oyobi Nensho (Fuel and Combustion)*, 42(11):993-1001, Nov. 1975.

Dust collection by electrostatic precipitator for eight petroleum heating furnaces and three boilers having a total emission of 500,300 cu m/hr is described. The waste gas contained 0.01-0.02 g/N cu m of dusts: 40% ash, 33% carbon, 15% moisture, and 12% sulfur trioxide. Three units of electrostatic precipitators with a scheduled overall capacity of 600,000 cu m/hr were installed. The electrostatic precipitators treated gas at 190 C and reduced the dust content of the waste gas by 75% from 0.2 g/N cu m to 0.05 g/N cu m. Test results showed that the electrostatic precipitators had an actual overall capacity of 450,000 cu m/hr and reduced dust content by 66.7%.

58596

APTIC NO. 81991

Ireland, Roy D., Jr. and Francis E. Dahlem

SCRUBBER CONTACT ELEMENTS. (*American Air Filter Co., Inc., Louisville, Ky.*) U. S. Pat. 3,911,066. 6p., Oct. 7, 1975. 9 refs. (Appl. Nov. 9, 1973, 4 claims).

An improved contact element for mobile bed type scrubbers is described which possesses an extended operating life in comparison with conventional elements. The contact element consists of a closed cell, foamed polymeric resinous material having a density of between 10 and 20 lb/cu ft, a compressive strength between 1 and 8 psi, a wear resistance of greater than 8000 hr based on an acceptable decrease in surface area of about 45%, and an energy absorption coefficient (expressed as percent of static rebound) in the range of 30-75%. (Author summary modified)

58597

APTIC NO. 79971

Irie, Toshimasa and Toru Isoda

DUST COLLECTION EFFECT AND TRIAL MANUFACTURE BY GRAVITY AND CENTRIFUGAL FORCE. (*Juryoku oyobi enshinryoku no yoru shujin koka to shinsakurei*). Text in Japanese. *Osaka Prefecture Industrial Research Institute, Osaka (Japan)*, *Osaka Prefectural Industrial Research Institute Meeting, Osaka, Japan*, June 15, 1975, p. 31-32.

A new development in gravity dust collection is described. The effects of gravity and centrifugal force on dust collecting efficiency were examined by sending dusty air into a doughnut-shaped wind path. At high revolution fluid speeds of air, centrifugal force was dominant, and at low speeds the gravity force was dominant. At 1.6 m/sec of fluid speed the dust collection efficiency of gravity and centrifugal force were comparable. As a result of the present study, a new design for a dust collector which utilizes both gravity and centrifugal force was developed.

58598

APTIC NO. 75959

Isaacs, Gerald A. and Fouad K. Zada

SURVEY OF FLUE GAS DESULFURIZATION SYSTEMS. LA CYGNE STATION, KANSAS CITY POWER AND LIGHT CO. AND KANSAS GAS AND ELECTRIC CO. (FINAL REPORT). *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio*, *Environmental Protection Agency Contract 68-02-1321, Task 6b, Program Element 1AB013, ROAP 21ACX-130*, Rept. EPA-650/2-75-057-b, 85p., July 1975.

NTIS: PB 244401/AS

A wet limestone flue gas desulfurization system serving an electric power generating facility is evaluated. The system consists of seven modules for particulate and sulfur dioxide

removal, with on-site limestone grinding and storage facilities. All flue gases are treated since there is no provision for bypassing flue gas around the desulfurization modules. A particulate removal efficiency of 97-99% is reported along with an SO₂ removal efficiency of between 70 and 83%. The initial installed capital cost of the system amounted to \$34 million, and subsequent modifications increased the cost to about \$45 million. The estimated operating and maintenance costs, including limestone, are 1.79 mills/kilowatt-hr, not including capital charges. (Author abstract modified)

58599

APTIC NO. 76063

Isaacs, Gerald A.

SURVEY OF FLUE GAS DESULFURIZATION SYSTEMS. PADDY S RUN STATION, LOUISVILLE GAS AND ELECTRIC (FINAL REPORT). *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio*, *Environmental Protection Agency Contract 68-02-1321, Program Element 1AB013, ROAP 21ACX-130, Task 6d, Rept. EPA-650/2-75-057-d*, 47p., Aug. 1975. 2 refs.

NTIS: PB 246136/AS

A field evaluation of the flue gas desulfurization system on Unit 6 of the Louisville Gas and Electric Company's Paddy's Run Power Station is presented. The closed-loop system utilizes a slurry of carbide lime in a marble-bed scrubber. The carbide lime, a waste by-product of a nearby acetylene manufacturing plant, contains 90-92% calcium hydroxide, 2-2.5% silica, 3-8% calcium carbonate, and 0.1% magnesium oxide. The sulfur dioxide collection efficiency of the system is about 85%. Capital cost of the system is \$3.7 million; operating costs amount to 2.5 mills/net KWH. The sludge from the system is stabilized and trucked to a nearby landfill. (Author summary modified)

58600

APTIC NO. 76092

Isaacs, Gerald A.

SURVEY OF FLUE GAS DESULFURIZATION SYSTEMS. PHILLIPS POWER STATION, DUQUESNE LIGHT CO. (FINAL REPORT). *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio*, *Environmental Protection Agency Contract 68-02-1321, Program Element 1AB013, ROAP 21ACX-130, Task 6c, Rept. EPA-650/2-75-057-c*, 79p., July 1975.

NTIS: PB 246285/AS

A field evaluation of the flue gas desulfurization system at Duquesne Light Company's Phillips Power Station (400 MW) is presented. The control system at this facility consists of four parallel Chemico venturi scrubber trains. In addition to the first stage particulate scrubbers, one of the four trains includes a second stage venturi absorber for the control of sulfur dioxide emissions. The system uses slaked lime as the absorbing medium and is in operation since July 1973. An overall SO₂ removal efficiency of 50-60% is reported. The use of magnesium oxide-modified lime is being investigated in an effort to increase the SO₂ removal efficiency of the existing system. Numerous start-up and operation problems are reported. (Author abstract modified)

58601

APTIC NO. 76093

Isaacs, Gerald A. and Fouad K. Zada

SURVEY OF FLUE GAS DESULFURIZATION SYSTEMS. HAWTHORN STATION, KANSAS CITY POWER AND LIGHT CO. (FINAL REPORT). *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio*, *Environmental Protection Agency Contract 68-02-1321, Program Element 1AB013, ROAP 21ACX-130, Task 6h, Rept. EPA-650/2-75-057-h*, 70p., Sept. 1975.

NTIS: PB 246629/AS

A field evaluation of two flue gas desulfurization systems at the Kansas City Power and Light Company's Hawthorn Power Station is presented. The operation of one system is by the in-

jection of dry limestone in the boiler's furnace, followed by tail gas scrubbing. The other system is modified to prevent tube plugging in the boiler; ground limestone is introduced into the flue gas near the gas inlet to the scrubber tower. Each system is capable of treating 500,000 acfm of flue gas at 300 F. Particulate and sulfur dioxide removal efficiencies for the systems are 99 and 70%, respectively. The annualized operating cost ranges between 2.2 and 2.5 mills/KWH. The capital investment associated with the systems is about \$5.6 million. (Author abstract modified)

58602

APTIC NO. 76107

Isaacs, Gerald A. and Fouad K. Zada

SURVEY OF FLUE GAS DESULFURIZATION SYSTEMS. LAWRENCE POWER STATION, KANSAS POWER AND LIGHT CO. (FINAL REPORT). PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1321, Program Element 1AB013, ROAP 21ACX-130, Task 6e, Rept. EPA-650/2-75-57-e, 73p., Sept. 1975.

NTIS: PB 246849/AS

A field evaluation of two flue gas desulfurization systems at the Kansas Power and Light Company's Lawrence Power Station is presented. Both systems utilize boiler injection of pulverized limestone, followed by tail-end wet scrubbing. Operating problems include corrosion, unsatisfactory damper operation, demister fouling, expansion joint failures, and pump failures. Availability figures for both units are recently reported to be close to 100%. The particulate removal efficiency for both units is 99.3%; the sulfur dioxide removal efficiency is 65%. The capital investment for the two units is about \$3.5 million. (Author abstract modified)

58603

APTIC NO. 76108

Isaacs, Gerald A.

SURVEY OF FLUE GAS DESULFURIZATION SYSTEMS. EDDYSTONE STATION, PHILADELPHIA ELECTRIC CO. (FINAL REPORT). PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1321, Program Element 1AB013, ROAP 21ACX-130, Task 6f, Rept. EPA-650/2-75-057-f, 42p., Sept. 1975. 1 ref.

NTIS: PB 247085/AS

A field evaluation of a magnesium oxide flue gas desulfurization system serving a boiler at Philadelphia Electric Company's Eddystone Station is presented. The system consists of three first stage scrubber modules in parallel for particulate control and a second stage absorber module with two venturi-rod beds for sulfur dioxide control. The system is designed for 90% SO₂ removal, though as of April 1, 1975 the second stage module is not yet in operation. The particulate removal efficiency of the system is 99.9%. The unit cost amounts to \$193/KW and includes the installation cost of the three first-stage particulate scrubbers. (Author summary modified)

58604

APTIC NO. 76109

Isaacs, Gerald A.

SURVEY OF FLUE GAS DESULFURIZATION SYSTEMS. DICKERSON STATION, POTOMAC ELECTRIC POWER CO. (FINAL REPORT). PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1321, Program Element 1AB013, ROAP 21ACX-130, Task 6g, Rept. EPA-650/2-75-057-g, 50p., Sept. 1975. 2 refs.

NTIS: PB 246850/AS

A field evaluation of a flue gas desulfurization system utilizing the Chemico/Basic magnesium oxide-sulfur dioxide removal/recovery process is presented. The system is retrofitted to handle about half of the exhaust gas from a 190-megawatt pulverized coal-fired boiler at the Potomac Electric Power Company's Dickerson Station. A single, two-stage

AIR POLLUTION ABSTRACTS, JUNE 1976

scrubber/absorber is used. The first stage incorporates an adjustable venturi for particulate removal, and the second stage uses a fixed venturi configuration to remove SO₂. The liquor streams for the two stages are separate and independent. Both streams are operated in a closed-loop mode. The particulate removal efficiency of the system is 99.3%; sulfur dioxide removal is 90%. The capital cost of the system is about \$6.5 million. (Author summary modified)

58605

APTIC NO. 76110

Isaacs, Gerald A. and Fouad K. Zada

SURVEY OF FLUE GAS DESULFURIZATION SYSTEMS. WILL COUNTY STATION, COMMONWEALTH EDISON CO. (FINAL REPORT). PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1321, Program Element 1AB013, ROAP 21ACX-130, Task 6i, Rept. EPA-650/2-75-057-i, 71p., Oct. 1975.

NTIS: PB 246851/AS

A wet limestone flue gas desulfurization system at Commonwealth Edison's Will County Station boiler Number 1 (146 MW) was evaluated. The desulfurization system consisted of two flue gas desulfurization modules, limestone handling and milling facilities, and a sludge treatment and stabilization unit. Each module consisted of a venturi scrubber followed by a two-stage absorption tower. The collection efficiency of the system ranged from 82-90% for sulfur dioxide and was 99.7% for particulates. Operating problems were mainly confined to the demister and reheater units. Additional spray nozzles were installed to keep the demister free of slurry deposits. The annualized operating cost is estimated to be 12 mills/KWH based on an assumed boiler capacity factor of 35%. The estimated capital cost is \$115/KW, including \$13/KW for sludge treatment. (Author abstract modified)

58606

APTIC NO. 76112

Isaacs, Gerald A. and Fouad K. Zada

SURVEY OF FLUE GAS DESULFURIZATION SYSTEMS. MOHAVE STATION, SOUTHERN CALIFORNIA EDISON CO. (FINAL REPORT). PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1321, Program Element 1AB013, ROAP 21ACX-130, Task 6k, Rept. EPA-650/2-75-057-k, 46p., Oct. 1975. 1 ref.

NTIS: PB 246929/AS

An evaluation of two prototype sulfur dioxide absorber modules installed in 1973 at the Mohave Generating Station of Southern California Edison Company was performed. A wet limestone vertical module rated at 170 MW was installed to treat 450,000 standard cu ft/min of the flue gas from one boiler, and a wet lime horizontal module which was also rated at 170 MW was installed to treat a similar flue gas portion from another boiler. The SO₂ removal efficiency of the horizontal module varied from 75-98%, while the efficiency of vertical module could not be assessed. The vertical absorber was damaged by a fire during start-up and was subsequently rebuilt and tested. Both absorbers were preceded by electrostatic precipitators operating at 98.2% efficiency.

58607

APTIC NO. 83613

Ishahaya, Fumio

EXHAUST GAS CLEANING APPARATUS. (Hitachi, Ltd., Japan) U. S. Pat. 3,885,918. 6p., May 27, 1975. 3 refs. (Appl. Sept. 1, 1972, 18 claims).

An apparatus for removing acidic air pollutants from exhaust gas is described. A liquid containing alkali material is sprayed in a form of fine particles into exhaust gas containing acid material such as nitrogen oxides, sulfur oxides, fluorine gas, chlorine gas, and/or hydrogen chloride. The materials react with each other to produce solid particles which are separated from the exhaust gas. The solid particles are of predetermined size for easy separation.

CONTROL METHODS

58614

58608

APTIC NO. 82136

Ishihara, Yoshimi, Hisashi Fukuzawa, and Chubei Asakawa

STUDIES OF SULFUR OXIDES REMOVAL FROM FLUE GAS BY DRY LIMESTONE INJECTION PROCESS (V). SULFUR DIOXIDE REMOVALS AT FULL SCALE DRY LIMESTONE INJECTION TESTS AND REUSE OF RECOVERED LIME. (*Sekkaiseki fukukomiho ni yoru haen datsuryu no kenkyu* (V). *Jitsu boira shiken ni okeru datsuryuritsu to kaishu funmatsu no sairiyo hoho*). Text in Japanese. *Nenryo Kyokaishi* (J. Fuel Soc. Japan) (Tokyo), 54(548):973-982, Dec. 1975. 4 refs.

Stack gas desulfurization by the limestone injection method was investigated in terms of desulfurization efficiency and utilization of recovered lime by the Central Electric Institute, Emission Gas Control Committee. The desulfurization tests were conducted using the boilers at the Mie Steam Power Plant and Meiko Steam Power Plant during October 1965 and July 1967. A desulfurization rate of 40% was achieved when limestone powder was injected at a rate of two times more than the volume of the sulfur dioxide and a rate of 60% was achieved when hydrated limestone powder was injected at a rate 2.6 times more than the volume of sulfur dioxide. However, actual use of this method on industrial boilers is questionable because of the low desulfurization rate, adhesion of dust inside the boiler and undeveloped application of spent lime powders. The most feasible application of spent lime powder may be to recycle it to the injection process after hydration.

58609

APTIC NO. 82202

Ishihara, Yoshimi, Hisashi Fukuzawa, and Chubei Asakawa

STUDIES ON SULFUR OXIDES REMOVAL FROM FLUE GAS BY DRY LIMESTONE INJECTION PROCESS (V) -- SULFUR DIOXIDE REMOVALS AT FULL SCALE DRY LIMESTONE INJECTION TESTS AND REUSE OF RECOVERED LIME. Text in Japanese. *Nenryo Kyokaishi* (J. Fuel Soc. Japan) (Tokyo), 54(12):973-982, 1975. 4 refs.

Full scale dry limestone injection field tests were carried out at two power station boilers. An equation is given to calculate the ratio in the boiler from the ratio of reacted lime in the pilot furnace tests. Sulfur dioxide removal in boilers is the sum of SO₂ removal by deposited lime and the products of the ratio of reacted lime and the amount of injected limestone. Sulfur dioxide removal by deposited lime increased with the increase in deposition, but there were consequent difficulties in boiler operation. The hydrated sorbents recovered in the precipitator gave the same SO₂ removal as new limestone when reinjected into the boilers. (Author abstract)

58610

APTIC NO. 84037

Ishino, Kyo and Hiroyuki Yoneda

ANOTHER TRAIL ON AIR POLLUTION SUBSTANCE RECYCLING TREATMENT. (*Taiki osen busshitsu saisei shori ni tsuite no hitotsu no kojoromi*). Text in Japanese. *Kinki Daigaku Kogai Kenkyusho Kenkyu Hokoku* (Kinki Univ. Pollut. Res. Inst. Rep.), no. 3:65-78, Oct. 1975. 2 refs.

The possible retrieval of resources from industrial wastes containing iron discharged from steel and iron grinding, rolling and shotpeening processes was investigated. The dust containing large amount of iron from the above metal processing plants contributes to an unhealthy working environment, and it is reported that 15,000 tons/mo of such dust alone is discharged in Kawasaki City. The dust used for the test contained 96.83% of iron, and was reduced, melted and casted to retrieve dust as raw metal material, or to retrieve it as cast products. However, the dust is too minute to be reduced and melted as is, therefore an initial step must be taken to solidify the dust powder by a pressure mold, and a heat mold with a bond(pitch). The best molding condition for the pressure mold

is to use a pressure of 770 to 1500 kg/cu cm and for the heat mold is to use a temperature fo 120-150 C with 10 to 30% of pitch added to the total amount of the dust. The molded briquettes can be used as supplementary material for metal to be used for production of cast iron in a high frequency furnace and in a cupola.

58611

APTIC NO. 83835

Ishizaki, Shoji

REMOVAL METHOD OF HYDROGEN SULFIDE.

(*Ryukasuiso jokyo hoho*). Text in Japanese. (Kobe Steel Ltd. (Japan)) Japan. Pat. Sho 50-39074. 4p., Dec. 13, 1975. 1 ref. (Appl. Dec. 28, 1970, 1 claim).

A method for removing hydrogen sulfide, which will remove the H₂S in gas containing oxygen, and recover sulfur is presented. There is no satisfactory H₂S removal method existing which can be applied to gas containing oxygen. The new process uses a metal oxidation catalyst and an aqueous alkali solution with a water soluble H₂S oxidation catalyst to contact the gas containing oxygen and H₂S, removes the H₂S from the gas, and continuously and efficiently recovers sulfur. The metal catalysts mentioned herein are oxides, hydroxides, or a salt of titanium, vanadium, chromium, manganese, iron, copper, nickel, cobalt, zinc, molybdenum, wolfram, tin, lead, antimony, and silver or a mixture of these. The water soluble H₂S oxidation catalysts are compounds of polyoxy or compounds of polyoxy with hydrophilic radicals, nitrophenyls or salts of nitrophenyl, tannine or tannic acid, and dimethyl-nin. The alkali solution can be sodium carbonate, potassium carbonate, caustic soda, or caustic potash. The process has practically no loss of catalysts, releases no hydrogen sulfide into the air, and contains no toxic substances in the catalysts, yet economically achieves an H₂S removal rate of over 90% and a sulfur recovery rate of 77%.

58612

APTIC NO. 81138

Ito, K. and Y. Hirayama

RESOURCE RECOVERY FROM MUNICIPAL REFUSE BY SEMI-WET SELECTIVE PULVERIZING SYSTEM.

Ebara Manufacturing Co., Fujisawa (Japan), Environment Research Dept., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 354-359. 1 ref. (Nov. 3-5.)

The recovery of resources from municipal refuse by a semi-wet selective pulverizing system is discussed. The system is capable of recovering the following resources from municipal refuse: paper of comparatively high quality with potentially less water pollution on reuse compared with some other sources of secondary paper; plastics and metals free of garbage for further dry processing; fuels, without additional size reduction for fluidized bed gasification or incineration; and compostable materials without additional front end separation. (Author conclusions modified)

58613

APTIC NO. 81546

Ito, Mikiji, Motohisa Miura, and Toshiyuki Ito

EXHAUST GAS CONTROL VALVE. (*Nippondenso Co., Ltd., Kariya (Japan)*) U. S. Pat. 3,902,696. 5p., Sept. 2, 1975. 5 refs. (Appl. Sept. 25, 1973, 9 claims).

An exhaust gas control valve for reducing nitrogen oxide emissions from motor vehicle exhaust is described that offers increased durability over prior art designs. The device consists of two valve bodies and valve seats as well as a bellows for segregating the diaphragm and shaft guiding bush from exhaust gas. Valve endurance is enhanced by protecting the diaphragm from high-temperature exhaust gases.

58614

APTIC NO. 82538

Ito, Mikiji, Motohisa Miura, and Toshiyuki Ito

EXHAUST GAS CONTROL VALVE FOR USE WITH AN INTERNAL COMBUSTION ENGINE. (*Nippondenso Co., Ltd., Kariya (Japan)*) U. S. Pat. 3,894,713. 6p., July 15, 1975. 5 refs. (Appl. Sept. 25, 1973, 6 claims).

An exhaust gas control valve for reducing the emission of nitrogen oxides from an internal combustion engine of an automobile is described. A valve rod or shaft is supported by a valve seat formed at the inner end and fitted into a valve port. The valve seat body is substantially similar in construction to a spline fitting having a plurality of slots so that the valve rod as well as the round bore portion of the valve seat body have larger tolerances while a desired parallelism between the valve disk and the valve seat is attained. The brass bush used in the conventional exhaust gas control valve is eliminated so that the exhaust gas control valves are compact in size. The second diaphragm, common in other systems, is eliminated so that the control valve is used with the exhaust gas of a higher temperature. An exhaust gas cooling device located in the upper stream of the conventional control valve is eliminated. The cost of the pollution control devices for automotive vehicles is considerably reduced.

58615

APTIC NO. 82081

Iwata, Hiroyoshi and Yoshikazu Ishikawa

ELECTRONICALLY CONTROLLED FUEL INJECTION SYSTEM FOR ROTARY ENGINES. (Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,908,609. 6p., Sept. 30, 1975. 3 refs. (Appl. June 6, 1973, 1 claim).

An electronically controlled fuel injection system for a rotary combustion engine is described. It is capable of electronically controlling fuel injection valves to inject a proper amount of fuel into an intake pipe of the rotary combustion engine under all continuously variable engine operating conditions by means of sequential command pulse signals. They have a pulse width representing a proper duration for fuel injection/one revolution of the engine crank shaft. In conventional electronically controlled fuel injection systems for rotary combustion engines, fuel injection quantity is controlled by an electric pulse signal. The pulse signal is produced from the control circuitry and is fed to a solenoid or electromagnetic type fuel injection valve in which fuel injection is effected. The pulse interval of the pulse signal shortens in inverse proportion as the engine speed rises so that, during the high speed operation of the engine, the pulse signal is restricted in its pulse width representing the duration for fuel injection/one revolution of the engine crank shaft.

58616

APTIC NO. 82322

Iwata, Hiroyoshi, Koichi Sekiguchi, and Yoshikazu Ishikawa

ELECTRONICALLY CONTROLLED FUEL INJECTION SYSTEM FOR ROTARY INTERNAL COMBUSTION ENGINES. (Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,898,963. 6p., Aug. 12, 1975. 5 refs. (Appl. July 5, 1973, 3 claims).

A system for electronically controlling a fuel injection valve in a rotary internal combustion engine during deceleration is described. The system injects fuel into the engine once for each crankshaft revolution during normal engine operation, and once for two crankshaft revolutions during deceleration. The system alleviates the disadvantages of the prior art by preventing fuel from being fed into the engine during misfiring in the combustion chamber during deceleration so as to prevent unburned gas from being emitted from the engine and to eliminate undesirable car shake. (Author abstract modified)

58617

APTIC NO. 75198

Jahnig, C. E.

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES. GASIFICATION: SECTION 8. WINKLER PROCESS (FINAL REPORT). Exxon Research and Engineering Co., Linden, N. J., Environmental Protection Agency Contract 68-02-0629, Program Element 1AB013, ROAP 21ADD-023, Rept. EPA-650/2-74-009-j, 49p., Sept. 1975. 28 refs.

A review of environmental impacts associated with the Winkler coal gasification process is presented. The coal prepara-

tion section is capable of generating dust emissions, and a dust collector system is desirable for collecting vent gas and passing it through bag filters. Dust in the gasification section can be controlled with water sprays and partial wetting of the char. Hot carbonate or glycol scrubbing appears adequate for the recovery of hydrogen sulfide in the sulfur removal section. The sulfur plant is a likely source of odors which must be carefully controlled by proper operation. Proper design and placement of cooling towers can be used to avoid problems involving drift loss (mist and sprays) and fog formation.

58618

APTIC NO. 75200

Jahnig, C. E.

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES. LIQUEFACTION: SECTION 3. H-COAL PROCESS (FINAL REPORT). Exxon Research and Engineering Co., Linden, N. J., Environmental Protection Agency Contract 68-02-0629, Program Element 1AB013, ROAP 21ADD-023, Rept. EPA-650/2-74-009-m, 67p., Oct. 1975. 46 refs.

The environmental impacts of the Hydrocarbon Research Incorporated H-Coal coal liquefaction process are reviewed. Dust control is needed on the dryer vent gas, and nitrogen oxide emissions must be defined and controlled in the liquefaction section. Decreased NO_x emissions can be achieved by designing for a lower flame temperature and by using low excess air. Leaks in the hydrolification reactor are capable of causing objectionable odors, although this section of the plant is completely enclosed and no streams are normally discharged to the atmosphere. In the hydrogen manufacturing section, odor control may be needed on the ash and sour water streams; ammonia, sulfur compounds, and phenols may be troublesome if not controlled. The sulfur plant is a potential source of odorous emissions also, and an effective tail gas cleanup system is needed on the Claus plant to assure low sulfur emission. The utilities section of the plant must be controlled for dust, sulfur, nitrogen oxides, and carbon monoxide. Cooling towers may present problems due to drift loss, i.e., mist or spray carried out with the air leaving the tower.

58619

APTIC NO. 76118

Jahnig, C. E.

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES. GASIFICATION: SECTION 6. HYGAS PROCESS (FINAL REPORT). Exxon Research And Engineering Company, Linden, N. J., Environmental Protection Agency Contract 68-02-0629, Program Element 1AB013, ROAP 21ADD-023, Rept. EPA-650/2-74-009-h, Exxon/GRU.11DJ.75, 60p., Aug. 1975. 38 refs.

A field evaluation of the HYGAS process which generates synthetic pipeline gas from coal is presented, with particular emphasis on the environmental impact of the process. The process involves the gasification of coal with medium Btu gas (mainly carbon monoxide plus hydrogen and steam) in a series of countercurrent fluidized zones. Residual char is then gasified with oxygen and steam in a bottom zone to provide gas for gasification in the upper zones. Major stack gas constituents generated by the process include hydrogen sulfide and carbon dioxide, and acid gas treatment must be employed. Methanation and drying are carried out in a closed system, and no streams normally escape to the atmosphere. Tail gas cleanup by sulfite scrubbing is used for an auxiliary Claus sulfur recovery unit. Nitrogen oxide generation by a boiler serving the plant utilities appears to be somewhat of a problem, with the exact amount emitted depending on furnace design and operating conditions.

58620

APTIC NO. 76119

Jahnig, C. E.

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES. GASIFICATION:

SECTION 7. U-GAS PROCESS (FINAL REPORT). Exxon Research and Engineering Co., Linden, N. J., Environmental Protection Agency Contract 68-02-0629, Program Element 1AB013, ROAP 21ADD-023, Rept. EPA-650/2-74-009-i, Exxon/GRU.12DJ.75, 46p., Sept. 1975. 25 refs.

A review of the U-Gas process for the gasification of coal is presented, with particular emphasis on the environmental impact of the process. The process involves the drying, crushing, and conveying of coal to a pretreater where caking properties are destroyed by partial oxidation in the presence of air. The pretreated coal is gasified with steam and air in a fluidized solids system at 1900 F and 300 psia to produce low Btu clean gas fuel suitable for use in a combined cycle power plant. Dust emissions from the coal preparation and drying operation are controlled with the use of water sprays, bag filters, and proper equipment maintenance. Sulfur in the coal feed is mostly removed by gasification and appears as hydrogen sulfide in the raw gas due to reaction with carbon monoxide. Raw gas treatment separates 99% of the H₂S and about one-half of the carbonyl sulfide present into a stream which is sent to a Claus plant. With tail gas cleanup, the sulfur plant gives 99+% removal of sulfur, leaving 1 ton/day of sulfur or 250 ppm of SO₂ in the tail gas.

58621

APTIC NO. 82067

Jakob, Fritz

ABSORPTION SYSTEM FOR SEPARATE RECOVERY OF CARBON DIOXIDE AND HYDROGEN SULFIDE IMPURITIES. (Linde Aktiengesellschaft, Wiesbaden (Federal Republic of Germany)) U. S. Pat. 3,910,777. 7p., Oct. 7, 1975. 9 refs. (Appl. Dec. 18, 1973, 10 claims).

A superatmospheric low temperature gas purification system for scrubbing of carbon dioxide, hydrogen sulfide, and carbon oxysulfide from gases using an organic polar solvent is described. The loaded solvent, after the scrubbing step, is freed of a portion of the components dissolved in it by means of expansion. This process removes H₂S by stripping the expanded loaded solvent with a stripping gas in a stripping column and then scrubbing H₂S out of the stripping gas with hot regenerative solvent. Although the conventional process permits a gas to be extensively freed of acidic constituents, it has the disadvantage, especially in the case of sulfur rich gas, that the H₂S cannot be separated from the CO₂. This drawback not only results in exhaust gas problems, it also complicates the working up of the S enriched gases to obtain a useful product.

58622

APTIC NO. 82151

James, Richard

PISTON POWER UNIT WITH STRATIFYING IGNITION SYSTEM. (Assignee not given.) U. S. Pat. 3,910,238. 9p., Oct. 7, 1975. 4 refs. (Appl. June 10, 1974, 16 claims).

A piston power unit with a stratifying ignition system is described. It contains an ignition chamber which includes a fuel injector and a spark plug. During the compression strokes of the pistons, a lean fuel mixture in the cylinder and ignition chamber is compressed. While one of the pistons is covering the ignition port, the mixture in the ignition chamber is enriched with fuel by means of the injector and then ignited. The ignition is transmitted to the fuel in the cylinder when the ignition port is uncovered by the piston. One piston uncovers the exhaust port before the other piston uncovers the intake port. The pistons close the ports at substantially the same time. This design results in lower fuel consumption and higher thermal efficiency in the engine. Much more complete combustion of the fuel is effected, which substantially reduces the output of the pollutants in the exhaust gases. (Author abstract modified)

58623

APTIC NO. 82152

James, Richard

OPPOSED PISTON POWER UNIT. (Assignee not given.) U. S. Pat. 3,910,239. 6p., Oct. 7, 1975. 5 refs. (Appl. June 10, 1974, 9 claims).

A simplified form of an opposed piston power unit is described. It overcomes the problems associated with the construction of an engine which uses a double throw single crankshaft. This arrangement allows for a blowdown period before the intake port is opened, and the closing of the ports at substantially the same time reduces or eliminates the loss of new charge fuel from the intake port through the exhaust port. Due to the inevitable offset of the connecting rods axially to the crankshaft, the pistons must have complementary offset portions and journals. This leads to a necessity for complex machining both of the pistons and the cylinder. It is difficult to seal the pressure in the cylinder, and the offset disturbs the scavenging air flow. This creates a turbulence which causes some of the new charge to mix with the exhaust gases and prevents complete scavenging of the gases, leaving a contaminated charge in the cylinder. The improved piston power units eliminate these problems.

58624

APTIC NO. 81996

Jenniges, Ernst

LOW SO₂ EMISSION SULFURIC ACID PROCESS FROM SULFUR AND OXYGEN. (Chemiebau Dr. A. Zieren GmbH and Co., KG, Cologne-Mungerdorf (West Germany)) U. S. Pat. 3,907,979. 5p., Sept. 23, 1975. 12 refs. (Appl. May 14, 1973, 11 claims).

A cyclic process for the production of sulfuric acid from sulfur combustion gases and oxygen is described which results in low sulfur dioxide emission levels as well as low nitrogen oxide levels and permits the use of a smaller waste heat boiler as compared with prior art processes. Sulfuric acid is produced from sulfur and an oxygen-containing gas containing at least 40% by volume of molecular oxygen by reacting the sulfur with the gas at about 900-3000 C to form an SO₂-containing combustion gas. The combustion gas is oxidized with oxygen in a main contact oxidation stage to form sulfur trioxide-containing contact gas which is absorbed in a main absorption step to form a residual SO₃ lean gas. The SO₃ lean gas is branched into two portions, with the first portions being heated and passed into the main contact stage in admixture with the SO₂-containing gas and oxygen. The second portion of the SO₃ lean gas is heated to a temperature of less than that of the first portion, and the heated portion of the SO₃ lean gas is passed to a postcontact oxidation stage for the conversion of residual SO₂ to SO₃. The resultant SO₂-depleted gas is subjected to a supplemental postcontact absorption step.

58625

APTIC NO. 82132

Jensen, Knud

EXHAUST SYSTEM. (Assignee not given.) U. S. Pat. 3,911,676. 21p., Oct. 14, 1975. 13 refs. (Appl. Nov. 3, 1972, 36 claims).

An internal combustion engine exhaust gas purification system which removes nitrogen oxides, hydrocarbons, and carbon monoxide as well as lead compounds and soot is described. The mechanical removal of lead and soot and the catalytic reduction of nitrogen oxides are accomplished in a first stage which contains a catalyst bed between spaced perforate retainers. Air is injected into the exhaust gas after it traverses the catalyst bed, and hydrocarbons and carbon monoxide are subsequently oxidized in a non-catalytic thermal oxidation reactor. The design of the system insures that lead poisoning of the catalyst is avoided and that the catalyst is not exposed to critical temperatures. (Author summary modified)

58626

APTIC NO. 82588

Jensen, Randolph A.

THRUST AUGMENTATION TO AVOID ODOR PROBLEMS FROM POINT SOURCES. Preprint, Purdue Univ., West Lafayette, Ind., 10p., 1975. 4 refs. (Presented at the Purdue Air Quality Conference Annual, 14th, Indianapolis, Ind., Nov. 12-13, 1975.)

The use of thrust augmentation to reduce ground level odor problems associated with stack discharges was investigated. A 3-horsepower axial flow blower rated at 10,200 cu ft/min was fitted with a transition piece to deliver the output of an odorous substance through an 8-inch diameter duct. A computer program for calculating atmospheric dispersion indicated a maximum ground level concentration of six times the threshold odor of the test substance at a point 1900 ft downwind when the axial flow blower was used as a thrust augmentor. A maximum ground level concentration of 150 times the threshold odor was calculated for a point 850 ft downwind under critical wind speed conditions and for the same discharge rate when thrust augmentation was not employed.

58627

APTIC NO. 82489

Jerde, James B.

LPG VAPORIZER. (Ransome Gas Industries, Inc., San Leandro, Calif.) U. S. Pat. 3,897,754. Sp., Aug. 3, 1975. 5 refs. (Appl. Oct. 16, 1974, 4 claims.)

A liquid petroleum gas vaporizer is described which has an elongated upright pressure vessel substantially surrounded by a water jacket. There are upright flues around the pressure vessel and extending through the water jacket from a combustion chamber below the pressure vessel to a flue chamber above the pressure vessel. Parallel thermo-syphon tubes are disposed in the pressure vessel and open at their bottom and top into the water jacket. The LPG liquid is supplied to the pressure vessel under float control and LPG gas is discharged from the pressure vessel; some is diverted for use in a burner in the combustion chamber. This vaporizer overcomes the problems of some installations where there are deposits in the exhaust mechanism of the vaporizer of materials which are highly deleterious to long term operation, and even in the gas circuitry there are sometimes deposits that are objectionable. (Author abstract modified)

58628

APTIC NO. 84086

Jo, Shakko

COMBUSTION IN ENGINES DRIVEN BY NEW FUELS. METHANOL ENGINES. (Shin nenryo engin no nensho. Metanoru engin). Text in Japanese. Preprint, Fuel Society, Tokyo (Japan), Combustion Section, p. 64-73, 1975. 12 refs. (Presented at the Combustion Method of New Engines Seminar, Tokyo, Japan, June 9-10, 1975.)

The use of methanol in automobile engines, especially the effects of the evaporation characteristics and octane value of methanol are discussed. Methanol is superior to gasoline in performance and the cleanliness of discharged gas. Difficulties are present in the starting of engines, instability of the transient characteristics, reactions with lubricating oils, and corrosion. The latent heat of evaporation of methanol is 263 kcal/kg, whereas that of gasoline is only 71. This difference is much increased when methanol is used with the addition of water. The octane value increases with the increase of the W/F ratio, which is the volume ratio between mixed water and methanol. The octane value of pure methanol is 90 and that of a mixture with W/F equal to 40% is about 115. At a definite compression ratio, a delay of ignition time decreases the net average effective pressure. When the compression ratio is high, the effective pressure reaches the maximum at the point of knocking. The concentration of NO_x and the volume of unburnt methanol plus hydrocarbon increase with an increase of the compression ratio. The concentration of carbon monoxide discharged from the same engine is almost the same for

methanol and gasoline when the excess ratio of air is the same. Methanol engines are quite promising for the future.

58629

APTIC NO. 82764

Johnson, D. W., Jr., P. K. Gallagher, F. Schrey, and W. W. Rhodes

PREPARATION OF HIGH SURFACE AREA SUBSTITUTED LAMNO₃ CATALYSTS. Preprint, Bell Labs., Murray Hill, N. J., 26p., 1975. 13 refs.

Methods for the preparation of oxide perovskite catalysts which are potentially suitable for the oxidation and reduction of automotive exhaust emissions were investigated. Perovskite catalysts containing lanthanum, manganese, and oxygen were produced with A site substitutions of strontium, lead, potassium, and cerium. They were likewise produced with B site substitutions of nickel, cobalt, lithium, and magnesium from nitrate solutions by freeze drying, spray drying, and precipitation. Freeze drying in some cases gave a single phase perovskite at a lower temperature than the other techniques. These catalysts were supported on ceramic monoliths, and their catalytic activity was measured using the oxidation of carbon monoxide as a test reaction. The substitution of the cations Sr and K for La in a LaMnO₃ catalyst in order to stabilize part of the Mn as tetravalent Mn produced catalysts with the highest conversion rates. A freeze dried catalyst consisting of La_{0.5}Sr_{0.5}MnO₃ possessed the highest surface area and the highest device activity of the group. B site modifiers (Li and Mg) which also stabilize multiple oxidation states for Mn also produced active catalysts but diluted available active sites. The substitution of Ni for Mn gave highly active catalysts, while similar substitutions of Co for Mn resulted in less active catalysts. (Author abstract modified)

58630

APTIC NO. 80107

Johnson, M. M. and G. P. Nowack

TO REMOVE TEL FROM HYDROCARBON. *Hydrocarbon Process.*, 54(10):119-122, Oct. 1975. 9 refs.

The use of a silica gel adsorption bed for the removal of tetraethyl lead from light hydrocarbons was investigated. A kinetic model was developed that accounts for the essential features of the decomposition collection reaction where the rate decreases as Pb accumulates on the adsorbent. The performance of the bed as a function of time, temperature, pressure, and inlet Pb concentration is described by solutions to the applicable differential equations from the method proposed by Biscoff. At temperatures of 200 C and above, the rates of reaction are rapid, the adsorption capacity high, and the material cheap and commercially available. With feedstocks containing 10 ppm Pb, the reagent cost is a very small fraction of the feedstock value. In substitute natural gas and hydroisomerization processes, pre-heat of the hydrocarbon to 200 C is an existing process step, and at little additional cost a fixed bed unit can be placed in the system to increase Pb removal and avoid catalyst fouling. (Author conclusions modified)

58631

APTIC NO. 83410

Johnson, T. F., K. C. Krupinski, and R. J. Osterholm

CLEAN COKE PROCESS: FLUID-BED CARBONIZATION OF ILLINOIS COAL. Preprint, American Chemical Society, Washington, D. C., 14p., 1975. 5 refs. (Presented at the American Chemical Society Division Fuel Chemistry Symposium, New Coke Processes Minimizing Pollution, Chicago, Ill., Aug. 24-29, 1975.)

Studies on the carbonization of Illinois No. 6 seam coal in a fluidized bed via the CLEAN COKE process are presented. The process produces a low-sulfur char that is ultimately converted to metallurgical coke. A typical carbonization of the coal feedstock resulted in the removal of 80% of the contained sulfur when preoxidized feed was used and the carbonizer was operated at 1365 F and a pressure of 80 psia for a 30-minute residence time. The sulfur content was reduced from 1.7% in

CONTROL METHODS

58638

the coal to 0.5% in the char product. Staged carbonization of coal containing 2.28% sulfur resulted in a final char containing 0.33% sulfur.

58632

APTIC NO. 81985

Jordan, Wenzel von, Hans-Joerg Barth, Hans Koch, and Guenter Boning

METHOD OF REMOVING SULFUR DIOXIDE FROM A DUST CONTAINING EXHAUST AND GAS STREAM. (Metallgesellschaft Aktiengesellschaft, Frankfurt am Main (West Germany)) U. S. Pat. 3,914,387. 6p., Oct. 21, 1975. 4 refs. (Appl. Jan. 14, 1974, 6 claims).

A method for removing sulfur dioxide from dust-laden gaseous exhaust streams is described that is more economical and less susceptible to fouling than prior art designs. The exhaust gas is treated with an aqueous solution of sodium hydroxide and disodium sulfate so that a major part of the SO₂ is reacted with the solution to form sodium sulfate in the presence of catalytically effective quantities of iron, cobalt, nickel, manganese, or vanadium (either inherently present in the gas stream or added externally). A portion of the solution is directly recycled into the scrubber, while another portion which is continuously withdrawn from the scrubber is treated with calcium hydroxide to precipitate calcium sulfate and form sodium hydroxide in the supernatant liquid. The latter is recycled to the scrubber, and the rate at which NaOH is returned from the second portion to the scrubber is approximately equal to the rate at which the NaOH is consumed in the scrubber by reaction with SO₂. (Author abstract modified)

58633

APTIC NO. 72908

Jorissen, H. Dieter

AND THEN HYDROGEN. (...und dann Wasserstoff). Text in German. Umwelt (Duesseldorf), 5(1):41-43, 1975.

Trends in the development of new engine designs and unconventional fuels for automobiles with respect to the recent oil shortage and to exhaust emission abatement are outlined. Gas turbines and electric drives are not suitable for practical use, and the Wankel engine reduces only the oxides of nitrogen emissions at the expense of increased fuel consumption. Axial piston engines are said to have strongly reduced carbon monoxide, unburnt hydrocarbon, and oxides of nitrogen emissions as compared with conventional designs. Stratified-charge engines, requiring only thermal afterburners, are seen as most promising in the near future. Considerable improvements on conventional spark-ignition and diesel engines with respect to a cleaner exhaust are also possible. Methanol and hydrogen, produced especially in nuclear power plants, are regarded as the most promising alternative fuels for gasoline.

58634

APTIC NO. 82299

Joshi, Suryakant

AIR-COOLED INJECTION INTERNAL COMBUSTION ENGINE WITH TURBULENCE CHAMBER. (Klockner-Humboldt-Deutz Aktiengesellschaft, Cologne (West Germany)) U. S. Pat. 3,895,613. 4p., July 22, 1975. 5 refs. (Appl. Oct. 11, 1973, 1 claim).

An air-cooled injection internal combustion engine with improved combustion and emission characteristics is described. The engine design includes a rotation-symmetric turbulence chamber cast into the cylinder head and a passage tangentially leading into the turbulence chamber. The length of the passage is slightly greater than the largest diameter of rotation. The fuel is injected into the periphery of the turbulence chamber approximately parallel to the longitudinal axis of the turbulence chamber.

58635

APTIC NO. 82319

Jozlin, Joseph A.

SECONDARY COMBUSTION CHAMBERS FOR INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,897,769. 5p., Aug. 5, 1975. 7 refs. (Appl. July 18, 1973, 3 claims).

A secondary combustion chamber for internal combustion engines was developed which conserves fuel and reduces pollution. Other combustion chambers are more complicated in design and construction, involve special valving and manifolding, added ignition devices, major modification of components and chambers, and are expensive. This chamber is formed by a cavity lying adjacent to the primary combustion chamber that communicates via one or more ports with the primary chamber. It is supplied with a fuel mixture, ignited, and exhausted. Jets of flame are shot into the primary chamber to induce burning of the residual unburned fuel mixture. A restrictive passage between the port and the cavity induces jet emission from the orifices upon the burning and expansion of the fuel mixture in the secondary chamber. (Author abstract modified)

58636

APTIC NO. 82246

Juntgen, Harald, Karl Knoblauch, Guenther Gappa, and Juergen Schwarte

PROCESS OF REMOVING SULFUR OXIDE FROM EXHAUST GASES. (Bergwerksverband GmbH, Essen (Federal Republic of Germany)) U. S. Pat. 3,913,253. 7p., Oct. 21, 1975. 3 refs. (Appl. Oct. 16, 1970, 9 claims).

An apparatus is described that increases the efficiency of removal of sulfur oxides from exhaust gas and withdrawing of sulfuric acid from the adsorbent at an increased concentration. Sulfur oxides are removed from exhaust gases by passage through a moving bed of granular, carbon-containing adsorbent. The bed of adsorbent moves downward through a perforated shaft. The direction of flow of the exhaust gas is transverse to that of the adsorbent. The flow of the gas is adjusted so that more gas passes through the upper portion of the bed than through the lower portion. The resistance to transverse flow of the gas through the adsorber can be reduced when the rate at which the adsorbent moves through the bed is greater near the side of the bed at which the gas enters than near the side through which the gas leaves. At a sulfur dioxide concentration in the exhaust gas of more than 3000 ppm, the adsorbent will have picked up only a small quantity of SO₂ before the SO₂ appears in the gas leaving the adsorber. This difficulty can be eliminated by separating off a portion of the purified gas, mixing it with fresh untreated gas, and recycling it to the adsorber. Using this technique, the adsorber can be charged with a substantially greater quantity of H₂SO₄, despite the fact that the rate of throughput of gas through the adsorber has been substantially increased. (Author abstract modified)

58637

APTIC NO. 82393

Jysky, Goran, Ilmar Mardla, and Bjorn Eriksson

DEVICE FOR COLLECTING DRILL DUST. (Ilmeg AB, Nykoping (Sweden)) U. S. Pat. 3,895,929. 5p., July 22, 1975. 7 refs. (Appl. July 17, 1972, 3 claims).

A device for collecting dust generated by rock drilling operations is described which permits removal of the dust collecting bag during operation without contamination of the working atmosphere. A stock of flexible tube material in the shape of a folded flexible hose is placed around the lower portion of a separating apparatus and arranged to be successively withdrawn in desired lengths to form successive bags. Means are also provided for securing the bag around the outlet of the separating apparatus.

58638

APTIC NO. 83911

Kachurinets, L. P.

MEASURES TO IMPROVE THE OPERATION OF GAS-CLEANING FACILITIES AT DNEPROENERGO. (Myeropriyatiya po ulutsheniu raboti ustroystv gazootchistki b dnyeproenergo). Text in Russian. Energ. Elektrif., no. 2:30-31, 1975.

Measures undertaken to reduce atmospheric pollution at a network of power stations along the Dniepr River are discussed. The changes introduced included replacing old electrostatic fil-

ters with wet-type dust separators equipped with turbulent venturi coagulators, installing battery cyclones and wet scrubbers, providing for combustion of petroleum residue and gas, installing improved venturi dust separators and 2-phase venturi tubes, and using more efficient electrostatic filters. Some defects were noticed during the assembly of precipitation electrodes; the lack of clearance between the elements of the electrodes upset their operation. Another defect was a low-quality electrostatic filter housing that caused a malfunction in the precipitation electrodes. The low rate of efficiency of the electrofilters in some cases resulted in increased emissions. Rapid attrition of the exhaust fans produced a limited load insufficient pull and draft, inadequate quantities of air, and ultimately, gas corrosion.

58639

APTIC NO. 82859

Kagaya, Mineo

FUEL AND LUBRICANT EFFECTS ON AUTOMOTIVE OXIDATION CATALYSTS AND FUTURE TRENDS OF ENGINE LUBRICANTS. (Shokubai konbata no oyobosu gasorin oyobi enjinyu no eikyo to kongo no enjinyu no doko). Text in Japanese. Nainen Kikan (Internal Combustion Engine), 14(8):21-31, Aug. 1975. 25 refs.

Studies on the effect of gasoline and engine oil on the activity of catalytic converters are reviewed. As for gasoline, the effects of hydrocarbon composition (aromatic content 35%, 50%), lead, sulfur and phosphorus were investigated, and Pb and P in gasoline poisoned catalysts (platinum, palladium, copper-chromium), while the HC composition and S showed no ill effects. However, the permissible Pb content in gasoline from the standpoint of catalytic poisoning is considered to be less than the 0.05 g max/gal allowed in U.S.A. and the 0.07 g/gal allowed in Japan though it varies with engine size and type. As for the engine lubricants, the effect of additives containing zinc-dialkylthiophosphate, calcium and magnesium were investigated, and P showed some poisoning effect. However, P in the amount contained in the existing SE oil did not show a significant ill effect on catalytic activity. The future trends of engine lubricant are the use of low ash content oil, non-phosphorus oil and non-ash oil.

58640

APTIC NO. 83882

Kaijima, T.

MAINTENANCE OF THE ENVIRONMENTAL POLLUTION CONTROL FACILITIES. THE CASE OF THE KASHIMA PETROLEUM AND OIL REFINERY. (Kogai boshi setsubi no meintenansu. Kashima Sekiyu, Kashima seiyusho no keisu). Text in Japanese. Puranto Enginia (Plant Eng.), 7(11): 81-85, Nov. 1975.

Problems and key points of maintenance for a flue gas desulfurization apparatus are described. The apparatus was used to treat tail gas from a sulfur recovering plant. It treated 28,000 N cu m/hr of flue gas and the sulfur dioxide concentration was reduced from 12,000 ppm to about 200 ppm. The tail gas was cooled from 700 C to 65 C before being introduced to an absorbing tower containing sodium sulfite as absorbent. Fiber-reinforced plastics, stainless steel, and ceramics were the principal materials for the apparatus. The numbers of incidents of trouble and breakdown ranged from four in January 1975 to 23 in October 1974 during one-year operation from August 1974 to August 1975. Breakage and deformation accounted for 34% of the total breakdown of operation. Corrosion of gas ducts due to the condensation of SO₂ was the most serious damage.

58641

APTIC NO. 75204

Kalfadelis, C. D., E. M. Magee, G. E. Milliman, and T. D. Seart

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES. ANALYTICAL TEST PLAN (FINAL REPORT). Exxon Research and Engineering Co., Linden, N. J., Environmental Protection Agency Contract 68-02-0629, Program Element 1AB013, ROAP 21ADD-023, Rept. EPA-650/2-74-009-1, 184p., Oct. 1975. 66 refs.

Process and waste streams in the Lurgi coal gasification process and the Char-Oil-Energy Development (COED) coal liquefaction process are reviewed in terms of analytical requirements for assessing their pollution potential. Descriptions of each step in the above processes are presented along with analytical procedures for obtaining data on particulates, polynuclear compounds, hydrocarbons, carbon monoxide, organic sulfur compounds, sulfur dioxide, sulfuric acid mist, nitrogen dioxide, aldehydes, ammonia, phenols, cyanide, arsine, mercury, beryllium, fluorides, hydrogen fluoride, nickel and iron carbonyls, and hydrogen selenide.

58642

APTIC NO. 79606

Kalinkina, L. I. and G. N. Toropkina

MODELING A CATALYTIC REACTOR FOR THE PURIFICATION OF GASEOUS EMISSIONS CONTAINING PHENOL VAPORS. (Modelirovanie kataliticheskogo reaktora ochistki gazovykh vybrosov ot parov fenola). Text in Russian. Plast. Massy, no. 5:31-33, 1975. 9 refs.

A mathematical model of the oxidation of phenols contained in waste gases generated in plastic materials production on cupric oxide granules is presented. The phenol vapor concentrations varied from 0.25 to 1.25 mg/liter. The rate of conversion was found to decrease with increasing concentration of the reaction products. Transition from the diffusion into the kinetic range was found to occur with the increase of the conversion rate. The contact time increased with the phenol concentration, and decreased with increasing temperature in the 340-420 C range.

58643

APTIC NO. 82997

Kasai, Juichi, Kazuo Miyazaki, Keiji Kawasaki, and Buntaro Kawase

METHOD AND ARTICLE FOR REMOVING MERCURY FROM GASES CONTAMINATED THEREWITH. (Showa Denko Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,876,393. 5p., April 8, 1975. 3 refs. (Appl. Nov. 26, 1973, 12 claims).

A process for the removal of mercury from gases containing some amount of other impurities such as sulfur dioxide and halogens together with Hg is described. There is no other economical process for removing Hg from these gases. The Hg containing gas is passed over activated carbon impregnated with sulfuric acid, to eliminate the Hg from the gas by causing the Hg to be adsorbed on the acid impregnated carbon.

58644

APTIC NO. 83818

Kasamatsu, Tomomichi

RADIATION TREATMENT OF WASTE GAS. (Haiken no hoshasen shori ni yoru mukogaika). Text in Japanese. Yuki Gosei Kagaku Kyokai Shi (J. Soc. Org. Syn. Chem), 33(10):753-755, Oct. 1975.

The simultaneous removal of sulfur dioxide and nitrogen oxides from flue gas was studied using electron beam irradiation. The combustion gas of B-type heavy oil was passed through an electrostatic precipitator to remove the unburned hydrocarbons, then taken into the reaction tube where the electron beam treatment occurred. After the treatment, the products were removed by an electrostatic precipitator. With a dose rate of 430,000 rad/sec, most of NO_x could be removed in 2 sec; SO₂ removal reached 80% in 10 sec. Although the increased dose increased the removal efficiencies, a saturation point tended to be observed. The acceleration voltage did not affect the removal efficiencies, due to the short length of the reaction tube. An increased flue gas temperature lowered both removal efficiencies. The SO₂ removal efficiency at 100, 154, 195, and 245 C was 70%, 60%, 55%, and 30% respectively at the dose rate of 430,000 rad/sec, with an 8-second residence time. Increased residence time increased the SO₂ removal efficiency, however it did not increase the NO_x removal at higher temperatures. The latter observation suggested that an inverse reaction could be occurring at higher temperatures. The

removal efficiencies were not affected by either humidity or by an SO₂ to NO_x concentration ratio of up to 1.0. Although the exact composition of the reaction products could not be determined, the presence of metal oxides, water, sulfuric acid, hydrocarbons, silicon, sulfur, and nitrogen compounds was observed from the results of infrared absorption, ultraviolet absorption, gas chromatography, and thermal differential analysis.

58645

APTIC NO. 84300

Kasaoka, S. and E. Sasaoka

CATALYTIC REDUCTION OF NITROGEN OXIDE WITH AMMONIA OVER COPPER AND IRON SULFATE CATALYSTS. (*Ryusando oyobi ryusantetsu-kei shokubaijo no sankachiso no ammonia ni yoru kangen*). Text in Japanese. *Nippon Kagaku Kaishi (J. Chem. Soc. Japan)*, no. 9:1619-1626, 1975. 9 refs.

Nitric oxide was reduced with ammonia by dry-type selective reduction in the presence or absence of sulfur dioxide. The reduction was carried out in a flow tube reactor (12.0 mm in inside diameter) using coprecipitated metal oxides (copper oxide-alumina, ferric oxide-alumina) with or without treatment with SO₂-oxygen-nitrogen, or supported sulfates on alumina (copper sulfate, ferric sulfate, Fe₂SO₄-Al₂O₃) as catalysts. The catalyst (0.25-3.0 g) was packed at the center of the tube reactor which was heated with an electric furnace at 300-500 C. Sample gas containing 500 ppm NO, 0-3000 ppm SO₂, and 334-1000 ppm NH₃ was passed through the reactor at 1000 N cm/min. The coprecipitated metal oxides treated with SO₂-O₂-N₂ showed higher reactivities than those without the treatment. In the presence of SO₂, the reactivity of the untreated metal oxides increased with increasing time. The SO₂-treated metal oxides gave reactivities in the decreasing order of CuO-Al₂O₃, Fe₂O₃-Al₂O₃, cobalt oxide, and nickel oxide. Copper and iron sulfates were excellent with respect to activity and selectivity at temperature below 400 C. The reactivities of copper sulfate and iron sulfate were about the same and were independent of the SO₂ concentration. The reactivities decreased slightly with increasing water vapor concentration in the sample gas.

58646

APTIC NO. 82281

Katagiri, A., M. Kiyono, Z. Takehara, and S. Yoshizawa

ADSORPTION CHARACTERISTICS OF SULFUR DIOXIDE ON ACTIVATED CARBON IN PACKED COLUMN. (*Jyutensu ni okeru kasseitan no nisanka iou kyuchaku tokusei*). Text in Japanese. *Nippon Kagaku Kaishi (J. Chem. Soc. Japan)*, no. 10:1705-1712, 1975. 23 refs.

Sulfur dioxide adsorption characteristics of several forms of carbon were investigated in a packed column, and compared to their electrochemical properties. A mixture of SO₂, oxygen, water vapor, and nitrogen was passed through a packed column of activated carbon at a constant temperature (100 C or 150 C), and the concentration of SO₂ in the gas at the column outlet was determined at regular intervals. Breakthrough curves obtained for various carbons were analyzed on the basis of an adsorption rate equation which takes account of the filling of micropores with sulfuric acid. Two factors were found that characterized the adsorption ability of activated carbon: the rate constant, and the saturation point of adsorption. The rate constant was closely related to the electrochemical activity. Consequently, the electrochemical mechanism was confirmed for SO₂ adsorption on activated carbon. The expected relationship between the saturated amount of adsorption and the micropore volume of activated carbon was not apparent, but adsorption was related to the rate constant. Carbon which is active in the cathodic reduction of O₂ exhibits high activity for SO₂ adsorption. The activity of carbon decreased with treatment with air at 400 C, and increased markedly with treatment with ammonia at 800 C. Surface complexes of activated carbon are discussed in relation to its catalytic activity. (Author abstract)

58647

APTIC NO. 84301

Katagiri, A., C. Inazumi, Z. Takehara, and S. Yoshizawa

CATALYTIC OXIDATION OF SULFUR DIOXIDE ON CARBON SUSPENDED IN SULFURIC ACID. (*Ryusan chu ni kendaku saseta tansojo deno nisankaio no seshoku sanku*). Text in Japanese. *Nippon Kagaku Kaishi (J. Chem. Soc. Japan)*, no. 9:1471-1478, 1975.

Activated carbon powder was suspended in 1 N sulfuric acid as electrolyte in which sulfur dioxide and/or O₂ were dissolved, and the current-potential curves were obtained by using a platinum gauge as a collector electrode. The rate of catalytic oxidation of SO₂ was measured by titrating the SO₂ in the electrolyte with 0.01 N iodine solution using starch as indicator. Regular anodic and cathodic polarization curves, corresponding to electrochemical oxidation of SO₂ and reduction of O₂ on suspended carbon particles, respectively, were obtained with good reproducibility. The polarization curves showed possible simultaneous occurrence of the oxidation and the reduction. The reciprocal slope of the micropolarization curve near rest potential was proportional to the amount of suspended carbon and the stirring rate in the presence of SO₂ and O₂. The rate of catalytic reaction of SO₂ and O₂ in H₂SO₄ solution was proportional to the reciprocal slope for various activated carbons. Activated carbons exhibiting high activity in cathodic reduction of O₂ were also active in catalytic oxidation of SO₂.

58648

APTIC NO. 83694

Kato, Sataro

REGULATION OF HYDROCARBON AT STATIONARY SOURCES AND PRESENT STATUS OF CONTROLLING TECHNOLOGY. (*Koteihasseigen deno tankasuiso no kisei to taisaku gijutsu no genjo*). Text in Japanese. *PPM (Japan)*, 6(12):26-41, Dec. 1975.

The present regulations and control technology for hydrocarbon released from stationary sources are reviewed, with emphasis on technical problems related to treating organic solvent vapors. The environmental standard for hydrocarbons is presently under investigation by the Central Council for Control of Environmental Pollution. The hydrocarbon environmental standard aims at achieving the photochemical oxidant environmental standard, an hourly average of 0.06 ppm implemented in May 1973. One of the methods presently used for treating organic solvent vapor is the adsorption method, which can involve a comparatively simplified device and can achieve a dependable efficiency. It is the best method available as long as the amount and concentration of the treated gas are small. The afterburner method introduces organic gas into a combustion furnace, which requires a temperature of 650-800 C to achieve complete, harmless, and odorless combustion. The catalytic oxidation method aims at achieving complete combustion with low temperature, using catalysts such as white gold, nickel, and cobalt, and at reducing the use of supplementary fuels. If optimum operational conditions are known this is the most effective removal method for hydrocarbons contained in exhaust gas.

58649

APTIC NO. 84029

Katsnel son, B. D., A. T. Makushkin and E. V. Aronov

AERODYNAMIC CHARACTERISTICS OF A CYCLONE FURNACE FOR WASTE GASES WITH LOW CALORIFIC VALUE. (*Aerodinamicheskie kharakteristiki tsiklonnoy topki dlya szhiganiya nizkokaloriynykh otbrosnykh gazov*). Text in Russian. *Prom. Energ.*, no. 10:27-30, 1975.

The cyclone furnace model PPK-75/45-135, developed for the combustion of waste gases with low calorific value as generated by cracking plants, is described. The waste gases contain 8.4% of carbon dioxide, 1.21% oxygen, 5.66% carbon monoxide, 0.33% sulfur dioxide, 72.2% nitrogen, and 12.2% water. The calorific value is 171 kcal/cu m. Natural gas or fuel oil is used as auxiliary fuel. Combustion is done between 100-

1200 C. The favorable aerodynamic design, intense turbulence, and the high tangential speeds guarantee homogeneous mixture formation and optimal combustion.

58650

APTIC NO. 82680

Katsobashvili, Yakov Rafailovich and Anatoly Sergeevich Serenko

METHOD OF PRODUCING HIGHLY AROMATIZED LOW-SULPHUR HYDROCARBON PETROLEUM STOCK. (Assignee not given.) U. S. Pat. 3,882,013. 7p., May 6, 1975. 5 refs. (Appl. March 15, 1973, 18 claims).

A method of producing highly aromatized low sulfur hydrocarbon oil stock is described. It involves destructive catalytic hydroaromatization of vacuum gas oil at temperatures from 500 to 600 C under a pressure of from 5 to 50 atm at a space velocity of the stock feed of from 1-10/hr, with a hydrogen stock ratio of from 500 to 3000 cu nm/ton of stock. A fraction boiling between 200 to 300-400 C, the residue boiling above 300-400 C, and an aromatic concentrate from the hydroaromatized fraction that boils between 200 to 300-400 C are isolated. A method of processing the aromatic concentrate and residue into carbon black stock resides in a direct utilization of both either separately or in a mixture with each other at a ratio of from 100:6 to 100:60, respectively. The aromatic concentrate is processed into naphthalene by a direct hydrodealkylation in the presence of a catalyst containing the elements of Groups VI and VIII of the Periodic System, on solid carriers. The known method of producing highly aromatized stock for manufacturing carbon black are multistage ones and provide mostly for the production of ethylene, butylene, and benzene. (Author abstract modified)

58651

APTIC NO. 82385

Kattan, Abraham and John E. Gwyn

VAPOR RECOVERY AND DISPOSAL SYSTEM. (Shell Oil Co., Houston, Tex.) U. S. Pat. 3,897,193. 6p., July 29, 1975. 7 refs. (Appl. Sept. 27, 1973, 2 claims).

A system for the recovery and disposal of gasoline vapors contained in air vented from gasoline storage tanks is described. The vapor-laden air is passed through a conduit to a bed of absorbent which is back-flushed when it becomes saturated. The gasoline removed from the absorbent bed is then incinerated. A scheme employing two separate collection systems may also be used. The first collection system includes a vessel for storing gasoline vapor-rich air. The other collection system is used for passing vapor-laden air through an adsorbent bed, with the vapor-rich air being employed as a supplemental fuel to maintain combustion in an incinerator when insufficient gasoline is contained in the air used to backwash and regenerate the absorbent bed to support combustion. (Author abstract modified)

58652

APTIC NO. 82526

Katz, Seymour, John J. Croat, and Joseph V. Laukonis

LANTHANUM LEAD MANGANITE CATALYST FOR CARBON MONOXIDE AND PROPYLENE OXIDATION. *Ind. Eng. Chem. Prod. Res. Develop.*, 14(4):274-279, Dec. 1975. 14 refs.

The activity of single crystal lanthanum lead manganite (LaO.7PbO.3MnO_3) was compared to platinum/aluminum oxide, cobalto-cobaltic oxide, and copper oxide under conditions important to automotive emission control, including high temperature and the presence of gas phase poisons. The observed order of activity of fresh catalysts toward both carbon monoxide and cyclopropane oxidation in simulated automotive exhaust ambients was generally: $\text{Pt/Al}_2\text{O}_3$ greater than CO_3O_4 greater than LaO.7PbO.3MnO_3 greater than CuO . The $\text{Pt/Al}_2\text{O}_3$ remained the most active of the materials throughout tests in which the susceptibility of catalysts to various modes of deactivation, namely, high temperature exposure, sulfur dioxide poisoning, and reaction with gamma Al_2O_3 was measured. The single crystal manganite catalyst is

AIR POLLUTION ABSTRACTS, JUNE 1976

susceptible to thermal deactivation but resistant to SO_2 poisoning. Manganite also reacts extensively with gamma Al_2O_3 at 1000 C, suggesting potential difficulties with supported catalysts. Basic differences were found between the properties of single crystal and polycrystalline forms of LaO.7PbO.3MnO_3 . They showed different oxidation kinetics and the specific catalytic activity of the single crystals was found to be roughly 100 times higher than the polycrystalline materials. The enhanced activity might be due to the presence of small quantities of Pt. (Author abstract)

58653

APTIC NO. 76301

Kawaguchi, Katsuyuki

GAS TURBINE COMBUSTION EQUIPMENT. (*Gasu tabin nensho sochi*). Text in Japanese. (Mitsubishi Heavy Industries, Ltd. (Japan)) *Japan. Model Util. Sho* 50-20163. 3p., June 19, 1975. (Appl. June 24, 1971, 1 claim).

A modification of gas turbine combustion equipment, aiming at the control of smoke emission at high load is described. There is an air hole on the boss part of the swirl vane, and a number of air nozzles on the extending part of the boss, surrounding the fuel injection nozzle. There is an inclined plate with a number of small holes at the nose of the boss. Only a small volume of air passes through the air hole on the boss and the small holes on the inclined plate at low load, so that ignition occurs smoothly. At this stage, the combustion is stable since the area around the fuel injection cone is fuel-rich. As the rotation velocity and the air flow rate increase, the air passing through the air hole on the boss and the small holes on the inclined plate also increases, so that the gas mixture becomes air-rich and the combustion produces little smoke. In tests, the device reduced the Bacharach smoke number by 1.0-1.2.

58654

APTIC NO. 83267

Kawaguchi, Katsuyuki

GAS TURBINE COMBUSTION APPARATUS. (*Gasu tabin nensho sochi*). Text in Japanese. (Mitsubishi Heavy Industries Ltd. (Japan)) *Japan. Model Util. Sho* 50-36085. 2p., Oct. 21, 1975. 2 refs. (Appl. April 21, 1971, claims not given).

A smokeless combustion system for a gas turbine which controls the smoke level with a supply of pressurized air in the initial combustion area is described. The smoke in the gas turbine is generated from a fuel injection cone of the initial combustion area because of the shortage of air and poor mixing of air and fuel particles. Also in a gas turbine, there is less smoke during idling and an increase of smoke during heavy load operation. The design characteristic of the new process is multiple air injection holes installed on the extension of the boss of the swirl vane around the fuel injection opening. The air control valve opens whenever the smoke level should be decreased. The smoke level by this system can be lowered to level 3 of the Bacharach smoke number (BSN) whenever necessary.

58655

APTIC NO. 83126

Kawamoto, Kensuke, Tomoaki Tsuno, and Teruo Namiki

ANTIOXIDANT FOR THE AQUEOUS SOLUTIONS OF SULFITE AND/OR BISULFITE OF SODIUM OR POTASSIUM AND PROCESS FOR PREVENTING THE OXIDATION OF SAID AQUEOUS SOLUTION. (Mitsubishi Chemical Industries, Ltd., Tokyo (Japan)) U. S. Pat. 3,888,969. 6p., June 10, 1975. 2 refs. (Appl. Sept. 5, 1972, 10 claims).

An antioxidant for the aqueous solution of sulfate and for bisulfite of sodium or potassium is described. It consists of at least one compound selected from the group consisting of substituted phenols, tris (alkylphenyl) phosphates, alkyl phosphites, and glycerin monofatty acid esters. This antioxidant is an improvement over the prior art in that it effectively provides a method for washing waste gas to remove sulfur diox-

ide without producing undesirable sulfates within the absorbent solution. (Author abstract modified)

58656

APTIC NO. 83480

Kawasaki, H.

OPTIMIZATION AND ITS LIMIT IN THE SUPPRESSION OF NO_x IN PLANTS. (*Shisetsu ni okeru NO_x yokusei saitekika system to genkai*). Text in Japanese. Kankyo Sozo (*Environ. Creation*), 5(6):56-60, June 1975.

The main processes that produce nitrogen oxides, the suppression of NO_x formation, and the limit of the suppression are discussed. Usually, NO_x is manufactured from ammonia for the purpose of producing hydroxyl amine, sodium nitrate, and nitric acid. Some NO_x escapes during the manufacturing process and causes pollution. The other large source of NO_x is the use of nitric acid, which is important for the production of a number of materials, such as fertilizers, dyes, polyesters, plastics, catalyzers, and medicines. The concentration of NO_x discharged from HNO₃ manufacturing plants has been reduced to 50 ppm by the use of a catalytic reduction apparatus or an NE-process developed by the Nissan Engineering Co., Ltd. For the removal of NO_x discharged by the production of various materials from HNO₃, the wet oxidation method, the wet absorption-reduction method, and the catalytic reduction method are now available. The best method should be adopted depending upon the characteristics and the products of each factory. Recovery of NO_x as nitrate is the preferred method, because it is the most economical. Decomposition of NO_x to nitrogen and oxygen should be avoided because the decomposition requires additional energy.

58657

APTIC NO. 84219

Kawasaki, S.

ON DENITRIFICATION OF STACK SMOKE BY SUMITOMO CHEMICAL CO. PROCESS. (*Sumikashiki haiei dassho purosusu ni tsuite*). Text in Japanese. Anomina to Kogyo (*J. Ammonia Ind.*), 28(2):8-14, 1975. 4 refs.

Sumitomo Chemical Co.'s denitrification system consists of selective contact reduction with ammonia. Oxygen promotes reduction of nitrogen oxides, rather than interfering with it. Thousands of catalysts were screened, and the optimum catalysts, taking into consideration such factors as temperature, mole ratio of NH₃ and NO_x (in the case of waste gas after combustion, it is mostly NO), diameter of catalyst, and deterioration, were found and named C-1 and C-2; etc. they show stabilized activity over a broad temperature range of 300 - 400 C. The C-2 catalyst has a more than 90% denitrification ratio above 300 C. Perhaps for the first time in the world, this system was applied to waste gas from a heating furnace at Higashi Nippon Methanol Co., treating 200,000 N cu m/hr since May 1974 with good result, using off-gas and LPG (liquefied petroleum gas) as fuels. The waste gas from the furnace is around 300 C, to which ammonia is added; then mixture is then led to a denitrification reactor. There has been no need to use an afterburner. After heat exchange with air for heating the furnace, it is let out of stack. In order to cover pressure loss from the reactor, blowers are installed. The ratio of NH₃/NO_x is around 1.0. The gas at entry into the system contains about 200 ppm NO_x and 7% O₂. At exit, the gas is composed of less than 20 ppm NO_x and less than 10 ppm NH₃, with 90% denitrification ratio. This denitrification ratio was maintained even when waste gas was increased to 250,000 N cu m/hr, and at start-up, when the load changes.

58658

APTIC NO. 82015

Kawata, Tadao

APPARATUS FOR CLEANING THE DISCHARGE OF A SMOKESTACK OR THE LIKE. (*Kawada Kogyo Kabushiki Kaisha (Japan)*) U. S. Pat. 3,904,376. 6p., Sept. 9, 1975. 4 refs. (Appl. Feb. 22, 1974, 15 claims).

An apparatus for the removal of sulfur dioxide and particulates from stack discharges is described that takes advantage of the water soluble character of SO₂. The stack discharge is directed into a mixing chamber where it is mixed with steam. The mixture of steam and stack discharge is then cooled and liquefied. The liquefied mixture is then directed into a treating tank where particulate matter in the liquid is permitted to settle to the bottom. The liquid can be treated with suitable neutralizing agents to render the noxious gaseous components harmless. (Author abstract modified)

58659

APTIC NO. 76072

Keairns, D. L., D. H. Archer, J. R. Hamm, S. A. Jansson, B. W. Lancaster, E. P. O'Neill, C. H. Peterson, C. C. Sun, E. F. Sverdrup, E. J. Vidt, and W. C. Yang

FLUIDIZED BED COMBUSTION PROCESS EVALUATION. PHASE II - PRESSURIZED FLUIDIZED BED COAL COMBUSTION DEVELOPMENT (FINAL REPORT). Westinghouse Research Labs., Pittsburgh, Pa., Environmental Protection Agency Contract 68-02-0605, Program Element 1AB013, ROAP 21ADB-009, Rept. EPA-650/2-75-027-c, 486p., Sept. 1975. 169 refs.

NTIS: PB 246116/AS

Pressurized fluidized-bed coal combustion is evaluated in terms of its economic and technical feasibility and its environmental impact. The application of the combustion process to combined-cycle power plants utilizing adiabatic combustors appears to offer improved fuel economy and reduced energy costs within environmental constraints. No problems are identified which preclude meeting environmental standards. The processes are less sensitive to fuel variations and further advanced in development than are competitive advanced fossil fuel processes using state-of-the-art power generation equipment. Particulate loading permissible for gas turbine operation is projected to be less than 0.012-0.093 g/cu m. Nitrogen oxide emissions from pressurized fluidized bed boilers and adiabatic combustors are expected to be well below the Environmental Protection Agency emission standards. More than 90% of the potential sulfur dioxide emissions can be prevented using limestone or dolomite as sorbents in the sulfur removal system.

58660

APTIC NO. 82252

Kearsley, Walter H.

CATALYTIC CONVERTER. (*Fram Corp., East Providence, R. I.*) U. S. Pat. 3,912,459. 5p., Oct. 14, 1975. 5 refs. (Appl. Dec. 13, 1972, 2 claims).

A catalytic converter for internal combustion engines is described which has an improved suspension system for carrying a fragile catalyst housing. The housing is retained within a surrounding casing by a resilient support media which restricts transverse movement of the housing relative to the casing. Destructive longitudinal housing movement, common in other converters, is prevented by the support media in conjunction with the respective shapes of the housing and casing. The casing is strengthened by tapering from a larger cross section at the middle to a smaller one at the end, while the housing is of uniform cross section throughout. Various other combinations of housing and casing shapes are possible which similarly retard housing movement. (Author abstract modified)

58661

APTIC NO. 83152

Kelley, Charles N.

TAIL PIPE SYSTEM. (*Harold Schnair, Delta Quality, Dallas, Tex.*) U. S. Pat. 3,889,772. 4p., June 17, 1975. 5 refs. (Appl. Nov. 21, 1973, 8 claims).

A tail pipe system used with a plurality of different makes and models of vehicles for conveying engine exhaust gases from a point located to the front of the rear wheel axle to a point adjacent to the rear of the vehicle is described. No other multi-section tail pipe is as versatile in its application. This system consists of rigid sections with a connection allowing angular

adjustment between the portion of the tail pipe extending over the rear wheel axle and the portion extending to the rear of the vehicle. (Author abstract modified)

58662

APTIC NO. 83366

Kelly, Harold D., Charles F. Block, and Thomas L. McDonald
AMMONIUM NITRATE PLANT. (Masar, Inc., Richmond Heights, Ohio) U. S. Pat. 3,881,004. 19p., April 29, 1975. 8 refs. (Appl. Dec. 29, 1972, 26 claims).

An ammonium nitrate fertilizer plant is described which has an ammonia converter for producing oxides of nitrogen. The plant includes a wet waste heat boiler and a condenser for cooling the gases, a multi-stage countercurrent absorption tower for recovering nitric acid, and a neutralizer reacting the nitric acid with ammonia to produce ammonium nitrate. The plant is characterized by an ammonia cooled refrigerator absorber preheating such ammonia while simultaneously refrigerating the tail gas from the absorption tower. Unlike conventional plants, this plant provides economical absorption of the nitrogen oxides and reduced nitrogen oxides emissions to acceptable levels in a simple, reliable, and efficient manner with a minimum investment in new equipment. (Author abstract modified)

58663

APTIC NO. 83638

Kemmettmueller, Roland

POLLUTION FREE COAL PREHEATING WITH WASTE HEAT FROM DRY COKE-QUENCHING. (American Waagner-Bird Co., Inc., Pittsburgh, Pa.) U. S. Pat. 3,888,742. 9p., June 10, 1975. 5 refs. (Appl. Jan. 23, 1974, 21 claims).

A method for pollution-free coal preheating using waste heat from dry coke quenching is described. An inert completely dry gas is directed through a body of hot coke which has just been discharged from a coke oven in order to cool the hot coke. The hot inert gas is placed directly in contact with the wet coal so that the wet coal is dried and preheated with heat extracted from the coke by the inert gas. After the coal is dried and preheated, the inert gas is cleaned, dried, and returned to flow again through a body of hot coke. The inert gas is continuously circulated along a closed path extracting heat from hot coke and delivering the heat to wet coal. Other arrangements are extremely expensive in that the heat exchanger used to take heat from the dry quenching gas and deliver the heat to the coal drying and preheating gas is an extremely expensive unit. Such a heat exchanger is complex in its construction, requires a relatively large amount of space, and creates problems with respect to installation and maintenance. (Author abstract modified)

58664

APTIC NO. 83024

Kenson, Robert E. and Samuel S. Cha

THE ASSESSMENT AND CONTROL OF INDUSTRIAL ODOR PROBLEMS. Preprint, Research Corp. of New England, Wethersfield, Conn., 15p., 1975. (Presented at the Energy and the Environment National Conference, 3rd, Oxford, Ohio, Sept. 29-Oct. 1, 1975.)

The assessment and control of industrial odor problems are discussed. Specific topics considered include: methods for conducting odor surveys, the measurement of odor emissions, the definition of sources to be controlled, the determination of the degree of control required, and the selection of cost effective control concepts. Odor control techniques reviewed include: process modification, the use of taller stacks, chemical scrubbing, carbon adsorption, and incineration. Chemical scrubbers deserve serious consideration as a possible odor control system in many cases where incineration is also applicable since the former offer the advantage of lower capital and operating costs. If incineration is the only viable solution, catalytic incineration should be considered if the effluent does not contain materials which are capable of poisoning or deactivating the catalyst.

100

58665

APTIC NO. 81135

Kenyon, Richard A.

THE DESIGN AND DEVELOPMENT OF THE MONROE COUNTY, NEW YORK, SOLID WASTE RESOURCE RECOVERY FACILITY. Rochester Inst. of Tech., New York, Coll. of Engineering. Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 256-261. 5 refs. (Nov. 3-5.)

The design and development of an 1815 metric ton/day resource recovery facility to become operational by early 1978 in Monroe County, New York is described. Specifications for refuse derived fuel were developed by the County and the Rochester Gas and Electric staff jointly. The fuel must be free-flowing and capable of being injected into the fuel firing mechanism at all times; free organics contained in the milled material furnished for fuel must be as low as practical but must not exceed 10% by weight, and the testing procedures used must be mutually agreed upon between the utility company and the fuel supplier. Under consideration at the present time are a variety of fuel preparation steps ranging from pyrolysis to pelletizing, as well as a variety of construction material manufacturing processes that use the refuse derived fuel as a primary raw material.

58666

APTIC NO. 83165

Keyes, Richard E. and Neil Justice

DEVICE GENERATING AND DIRECTING A FLOW OF COMBUSTION SUPPORTING GASEOUS MEDIA. (The Film Equipment Co., Cincinnati, Ohio) U. S. Pat. 3,899,984. 7p., Aug. 19, 1975. 2 refs. (Appl. May 20, 1974, 15 claims).

A portable device for generating and directing a flow of combustion supporting gaseous media is described. The flow of gaseous media from one nozzle is directed downward substantially along one side wall whereas the flow of gaseous media from the other nozzle is directed across the top of the open pit and against and downwardly along the other side wall. The flow of gaseous media from this nozzle provides a continuously flowing gaseous curtain over the open top of the incinerator, which effectively precludes the emission of smoke and fly ash into the atmosphere. The nozzles are so constructed and arranged to provide a continuous cyclical flow of combustion supporting gaseous media within the interior of the incinerator, thereby enhancing the ready and substantially complete and efficient combustion of the material contained. The devices of prior art each include an incinerator of specific design, integral with and part of the overall system, and an air flow device specifically adapted for use with the incinerator. Due to the complicated nature of these devices, permanent installation is generally required, and the waste materials must be transported to the incinerator.

58667

APTIC NO. 79668

Kim, Yong K., Melvin E. Deming, and John D. Hatfield

DISSOLUTION OF LIMESTONE IN SIMULATED SLURRIES FOR REMOVAL OF SULFUR DIOXIDE FROM STACK GASES. Environ. Sci. Technol., 9(10):949-952, Oct. 1975. 4 refs.

The effect of experimental conditions on the dissolution rate of limestone in simulated slurries for the removal of sulfur dioxide from stack gases was investigated. The slurry was at pH 5.5. Both the dissolution rate and the degree of utilization of the limestone are nearly proportional to the geometrical surface of the stone. The rate of dissolution is increased by decrease in the particle size of the stone, pH, and oxygen content of the gas, and by a rise in temperature. The degree of utilization of the limestone to form sulfite or sulfate generally increases as the rate of dissolution increases. Addition of a weak organic acid, such as benzoic acid, increases the rate of dissolution of the limestone about 10%. (Author abstract modified)

58668

APTIC NO. 82516

Kimura, T. and K. Ishio

CENTERING AROUND MORETANA TYPE DESULFURIZATION AND DENITRIFICATION OF STACK SMOKE. (Moretana shiki haien datsuryu dassho sochi o chushin to shite). Text in Japanese. Chuko to Tanko (Cast. Forge. Steel), no. 263-21-26, June 1975.

The Moretana wet-type desulfurization and denitrification equipment jointly developed by the Sumitomo Metal Co. and the Fuji Kasui Co. for furnaces and boilers burning heavy oil (39,000 N cu m/hr) is described. Moretana is porous board, installed inside an absorption tower in several layers. Absorption fluid comes down from the top of tower and mixes with waste gas containing sulfur oxides and nitrogen oxides, which is blown upward from the lower part of the tower, causing bubbles in which SO₂ and NO₂ are rapidly absorbed and fixed. Pressure loss in the absorption tower is less than for other types. The process is efficient and compact. For desulfurization, a lime slurry is used. The calcium carbonate formed after the desulfurization reaction does not clog, since Moretana can clean itself, and with adequate pH control, long-time operation is possible. By oxidizing calcium sulfate, gypsum can be recovered. Denitrification of waste gas is done by caustic soda. Denitrification is oxidation-reduction type. Most of the nitric oxide contained in waste gas is oxidized into nitrogen dioxide, which is easier to absorb with water. As an oxidizing agent, chlorine dioxide is used, which is introduced into the piping between the cooling tower and the absorption tower. Within the absorption tower, NO₂ is turned into harmless gaseous nitrogen with a reducing agent. The acid generated is neutralized within the absorption tower by an alkali absorption liquid. Since half of the NO is oxidized into NO₂, and the other half becomes nitric acid, by this process alone a 50% denitrification rate is achieved. Both desulfurization (over 99%) and denitrification (over 90%) can take place in the same tower. For boilers and heating furnaces, dust elimination can take place simultaneously.

58669

APTIC NO. 80330

Kin, A.

AIR CLEANING APPARATUS. (Kuki joka sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-8833. 4p., April 8, 1975. (Appl. Dec. 25, 1970, 1 claim).

A regulation system for the air flow in a high voltage air cleaning apparatus has been developed. By passing contaminated air through an electrical field between an anode and a cathode molecules in the air can be ionized and the air can be cleaned. In order to induce a positive air flow in the cleaning system, modulation voltage is applied on the third electrode between the anode and the cathode, so that the ionized electric current oscillates and a sound wave is emitted. This oscillation of ionized current is produced by the modulation signal which is fed from a triode oscillator.

58670

APTIC NO. 82989

Kirchhofer, Hubert, Josef Pervuznik, and Alfred Wunsch

METHOD OF AND APPARATUS FOR REDUCING HARMFUL EMISSIONS FROM INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,874,166. 10p., April 1, 1975. 8 refs. (Appl. Nov. 27, 1973, 11 claims).

Combustion air is compressed in a dynamic pressure wave machine by utilization of heat remaining in the engine exhaust gases. A reduction in harmful emissions from the engine is effected within the rotor of the pressure wave machine due to a primary recirculation of the exhaust gas into the air at the interface between the exhaust gas and the air. The amount of recirculation is at its lowest value at full load on the engine and increases sharply with decreasing load. The change in the amount of exhaust gas recirculated is made more uniform over the whole load range by means of a secondary recirculation, increasing at full load. Comparable methods which operate

with exhaust gas turbochargers require a separate control system for this purpose. The quantity of soot entrained into the pressure wave machine with the secondary recirculated gas does not impair the performance of the machine, whereas with a turbocompressor the consequences are serious. (Author abstract modified)

58671

APTIC NO. 83125

Kishigami, Kunio, Hiroshi Kobayashi, and Shigenobu Oshima

INCINERATION METHOD FOR COMBUSTIBLE INDUSTRIAL WASTAGE AND A FLUIDIZED BED FURNACE USED THEREFOR. (Babcock-Hitachi K.K., Tokyo (Japan)) U. S. Pat. 3,888 193. 6p., June 10, 1975. 5 refs. (Appl. Jan. 10, 1974, 8 claims).

An incineration method and a fluidized bed furnace for use in the treatment of industrial waste are described. Combustible industrial wastage pieces are carried under heating in the fluidized medium of cement clinker granules for incineration. Acid gases contained in a waste gas accruing from the incineration of the wastage are reacted with clinker granules to fix acid gases in cylinder granules. Acid gases are removed from the waste gas. Toxic acid gases produced during the incineration of the wastage are removed effectively, without atmospheric pollution, while keeping a long run operation. Unlike in other systems, this system requires no replacement of fluidizing medium even during the continuous end long-run operation. (Author abstract modified)

58672

APTIC NO. 82159

Kishimoto, Kyuji, Hiroshi Takeuchi, and Koreo Iwasa

ROTARY INTERNAL COMBUSTION ENGINE. (Nissan Motor Co. Ltd., Yokohama (Japan)) U. S. Pat. 3,915,126. 8p., Oct. 28, 1975. 2 refs. (Appl. March 25, 1974, 15 claims).

A fuel intake system which provides for stratification of the fuel charge to a rotary combustion engine is described. The system reduces quenching of the flame front and hence hydrocarbon and carbon monoxide emissions. The main fuel mixture is supplied by a lean-set carburetor, and a secondary fuel mixture is supplied by a rich-set carburetor and fed into a working chamber during the end of the intake phase to promote flame front propagation. A check valve prevents reverse flow through the secondary fuel mixture carburetor. (Author abstract modified)

58673

APTIC NO. 73408

Kisuna, Keiichi and Motoo Suzuki

MITSUBISHI GALANT 1600 MCA. (Mitsubishi Gyaran 1600 MCA). Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind. Tech. Rev.), 12(1):125-133, Jan. 1975.

An emission control package, MCA-IIB, developed by the Mitsubishi Motor Corporation, is described, together with the automobile (Mitsubishi Galant 1600 MCA) in which it is installed. The MCA-IIB is an exhaust gas purification system based on a combination of thermal factor and exhaust gas recirculation, which meets 1975 Japanese Emission Standards and California Emission Standards. Attention has been paid to durability and ease of maintenance of the purification system; drivability and economy of the automobile in which it is installed; safety (thermal sensors monitor high temperatures and heat which occur in the purification system and heat shields, hood fan, and alarm lamp have been installed). An integrated auto-diagnoser, called the MCA Checker, on sale at retail outlets, is available for checking electric circuitry. Partial specifications of the Mitsubishi Galant 1600 MCA are: type G 32 A engine, 1597-cc, 4-cylinder, water-cooled; overall length, 4200 mm; overall width, 1600 mm; overall height, 1395 mm; wheelbase, 2420 mm; smallest turn diameter, 4.7 m; gas consumption, 17.0 km/l for 60 km/hr steady driving; and acceleration time from 0 to 400 m, 19.5 sec.

58674

APTIC NO. 83377

Kitayama, T.

EXHAUST COUNTERMEASURE BY THE DRY CLEANING INDUSTRY. (*Dorai kuriningu no haiki taisaku*).Text in Japanese. *Akushu No Kenkyu (Odor Research J. Japan)*, 5(22):44-53, Oct. 1975. 6 refs.

One of the most prevalent solvents for dry-cleaning, tetrachloroethylene, is under legal restriction because of the noxious gas exhausted from the dry-cleaning machine which uses this solvent. The tetrachloroethylene contained in the exhaust gas must be collected and separated by solvent recovering devices, and a study was conducted on the suitability of tetrachloroethylene from the view point of noxious gas regulations and the prevention of malodor. The results of the study are reported in the following areas: comparative evaluation of solvents, industrial gasoline, and tetrachloroethylene for dry-cleaning; the nature of the exhaust gas from the dry-cleaner using tetrachloroethylene; the adsorption of tetrachloroethylene by activated carbon, and the results of solvent recovery tests using activated carbon adsorption. The Tokyo Pollution Prevention Ordinance regulates the amount of tetrachloroethylene in the exhaust gas (it should be below 100 ppm). An average of 10% of the weight of activated carbon of tetrachloroethylene can be recovered, with a minimum of 6.37% and maximum of 16.4%. The solvent-recovering device is effective not only for prevention of noxious gas but also for malodor, and will be more effective in the future when a closed system is applied to the dry-cleaning process.

58675

APTIC NO. 82400

Kizler, Harald and Peter Juergen Schmidt

EXHAUST EMISSION CONTROL SYSTEM FOR INTERNAL COMBUSTION ENGINES. (*Robert Bosch G.m.b.H., Gerlingen-Schillerhohe (Federal Republic of Germany)*).

U. S. Pat. 3,903,853. 6p., Sept. 9, 1975. 4 refs. (Appl. Dec. 13, 1973, 15 claims).

An internal combustion engine exhaust emission control system electronically controlling the air-fuel ratio is improved to render its operation essentially independent of fluctuations in supply voltage and to provide an operator indication of malfunction of the system. The output from an oxygen sensor in the exhaust stream is applied as one leg of a bridge circuit, the other leg being supplied with a source of reference potential. The other branch is formed of a pair of resistors. An operational amplifier is connected across the diagonals of the bridge to provide an output signal when the sensing signal deviates from the reference. A connection of high resistance with respect to the sensing element is made from the supply source to the sensor so that, in case of failure of the sensor, a voltage will be applied to the bridge simulating a sensing signal and resulting in an output from the control system which commands the air-fuel composition to be very lean. (Author abstract modified)

58676

APTIC NO. 82611

Kleiman, Gerald

POZ-O-TEC. A PRACTICAL APPROACH TO HANDLING FLUE GAS SCRUBBER SLUDGE. Preprint, *IU Conversion Systems, Inc., Philadelphia, Pa.*, 16p., 1975.

(Presented at the American Power Conference, Annual Meeting, 37th, Chicago, Ill., April 1975.)

The Poz-O-Tec process for stabilizing flue gas scrubber sludge as well as fly ash and bottom ash produced at coal burning plants is described. The basic chemistry of the process is a combination of two sets of simultaneous reactions. The first reaction is a rapid one (24-72 hr) involving the sulfate/sulfite alkaline earth compounds which may be present in the scrubber sludge or added as needed. This reaction produces a fibrous gypsum with low permeability (0.00001 cm/sec) and moderate bearing properties. The second group of reactions is the cementitious phase which occurs between the alumina/silica in the fly ash, lime compounds, and the sulfur

oxide salts. This reaction takes place slowly over several months. As the above reactions proceed, the Poz-O-Tec composition gains strength, and its engineering properties improve. The end product is a structurally stable and environmentally acceptable material that is adaptable to most any area (ravines, strip mines, flat areas). The material can also be used as a road base, an impermeable liner material, or as landfill. The typical cost for sludge/ash stabilization by the process is \$2.30/ton of coal or 0.1 cents/KW hr for a 500-megawatt power plant.

58677

APTIC NO. 82487

Kleiman, Harold L. and Jean Jacques Martinat

FUEL FOR COOKING, HEATING AND LIGHTING.

(Technology Transfer Ltd., New York) U. S. Pat. 3,894,848. 2p., July 15, 1975. 4 refs. (Appl. April 12, 1974, 3 claims).

A fuel containing hexamethylenetetramine for cooking, heating, and lighting is described. The fuel contains hexamethylenetetramine alone or in admixture with additives such as stearyl alcohol. It also contains a sufficient quantity of one or more masking agents to substantially mask or diminish the malodorous products produced by the fuel when it is extinguished. This fuel possesses numerous advantages over charcoal in that it burns with a steady, substantially smokeless and odorless flame, and leaves very little residue. (Author abstract modified)

58678

APTIC NO. 83174

Klein, Herschel Alan and Carl Richard Bozzuto

AIR POLLUTION CONTROL SYSTEM. (*Combustion Engineering, Inc., Windsor, Conn.*) U. S. Pat. 3,870,781. 6p., March 11, 1975. 2 refs. (Appl. July 27, 1972, 6 claims).

An air pollution control system for treating the flue gases from a fossil fuel fired furnace is described. The gases are scrubbed with a solution of sodium hydroxide whereby Na⁺ and sulfite ion are formed in solution. The HSO₃(-) is then oxidized to form hydrogen ion and sulfate (-) ions. The solution is then causticized with calcium oxide to form NaOH and precipitate calcium sulfate. The precipitated CaSO₄ and the fly ash collected in the scrubber are then separated from the NaOH solution. The solution is diluted with make up water to form the NaOH scrubbing solution for recycle to the scrubber. This system eliminates the problems in other systems in which precipitates form in the scrubber and the system piping. (Author abstract modified)

58679

APTIC NO. 83668

Knoedel, P. A.

CLEAN AIR. SIX EXAMPLES FOR WASTE GAS CLEANING EQUIPMENT. (*Saubere Luft. Sechs Beispiele von Abluftreinigungsanlagen*). Text in German.*Oberflaeche*, 15(4):182-184, April 1975.

Examples of thermal and catalytic afterburners commercially available for waste gases generated in lacquering shops are described. The waste gases to be cleaned are usually polluted with carbon monoxide, solvent vapors, methanol, tetrahydrofuran, dioctylphthalate, dibutylphthalate, glycol ester and diglycols. The hourly capacities range from 800 to 10,000 cu m/hr. The waste heat generated during afterburning is utilized to heat up the waste gas in larger units. One model can be used alternately for thermal or catalytic afterburning. Natural gas or light fuel oil are used as an auxiliary fuel.

58680

APTIC NO. 82578

Knoll, Kenneth E., Wayne T. Davis, and Paul J. LaRosa

A PREDICTIVE PERFORMANCE MODEL FOR FABRIC FILTRATION BASED ON PILOT PLANT STUDIES.Preprint, *Air Pollution Control Assoc., Pittsburgh, Pa.*, 31p., 1975. 11 refs. (Presented at the Air Pollution Control Association Specialty Conference on the User and Fabric Filtration Equipment, Buffalo, N. Y., Oct. 6-7, 1975.)

A predictive performance model for fabric filtration based on pilot plant studies of baghouse pressure drop performance is presented. The predictive equations of fabric filter operating performance are based on the ability to predict the initial performance curve of a new (unconditioned) fabric filter after which the residual resistance of the conditioned filter is predicted based on the assumption that an effective residual dust cake is retained on the filter. An effective residual dust cake of 0.2 lb/sq ft provides an approximation of the residual resistance with a standard error of + or - .21 in. water/fpm for the cleaning mechanism operating conditions used in the study. The predictive equations are extended to include the prediction of the residual and maximum resistance of multi-compartmented fabric filter collectors. Sample calculations are performed on the predictive equations for two significantly different test fabrics (a monofilament fabric and an all-spun fabric) to illustrate the effect of fabric type and dust resistivity on the predicted operating resistance of a single and an eight-compartment fabric filter collector. (Author summary modified)

58681

APTIC NO. 79782

Kobayashi, Hiroshi, Shoyo Kawabata, Mikio Oda, and Toshiyuki Yamaya

A CLARIFICATION REACTION PROMOTER FOR EXHAUST GAS CLARIFIER. (*Haigasu jyokasochi no okeru jyoka hanna sokushin sochi*). Text in Japanese. (Hirakawa Iron Works, Ltd. (Japan)) Japan. Model Util. Sho 50-10452. 6p., April 2, 1975. 1 ref. (Appl. July 24, 1968, 1 claim).

A system for removing dusts and sulfur oxides from stack gas is described. This system consists of three cleaning processes. In the first process, in a horizontal chimney, solid dusts and sulfur oxides are removed by an alkali spray, for example ammonia, with water; the stack gas is precooled. In the second process, a rinsing tower, sulfur oxides are removed by a spray of water with an adjusted pH under controlled conditions of gas temperature and liquid/gas ratio. In the third process, a tower which has layers of iron chips, moisture, dusts, residual SO₂, hydrogen gas, and sulfur are filtered. Finally the filtered stack gas is diluted with air. To promote a fast reaction rate, a spray nozzle of pH-adjusted water is installed at the top of the iron chip layer tower, with an electromagnetic valve to adjust the amount of water.

58682

APTIC NO. 79783

Kobayashi, Hiroshi, Shoyo Kawabata, Mikio Oda, and Toshiyuki Yamaya

AN EXHAUST GAS CLARIFIER. (*Haigasu no jyoka sochi*). Text in Japanese. (Hirakawa Iron Works Ltd. (Japan)) Japan. Model Util. Sho 50-10451. 6p., April 2, 1975. 1 ref. (Appl. July 23, 1968, 1 claim).

A system for removing dusts and sulfur oxides from stack gas is described. This system consists of three cleaning processes. In the first process, involving a horizontal chimney, solid dusts and sulfur oxides are removed by sprays of an alkali (for example ammonia), and water, and the stack is precooled. In the second process, a rinsing tower, sulfur oxides gases are removed by a spray of water with adjusted pH under controlled conditions of gas temperature and liquid/gas ratio. In the third process, a tower which has layers of iron chips, moisture, dust, residual SO₂, hydrogen gas, and sulfur are filtered. Finally the filtered stack gas is diluted with air. For the higher efficiency of removing SO_x gas, a part of the liquid used in the first process is reused in the second process so that more SO_x may be absorbed by the ammonium sulfite which has been formed in the first process.

58683

APTIC NO. 79784

Kobayashi, Hiroshi, Shoyo Kawabata, Mikio Oda, and Toshiyuki Yamaya

AN EXHAUST GAS CLARIFIER. (*Haigasu no jyoka sochi*). Text in Japanese. (Hirakawa Iron Works, Ltd.

(Japan)) Japan. Model Util. Sho 50-10447. 6p., April 2, 1975. 1 ref. (Appl. Jan. 11, 1969, 1 claim).

A system for removing dusts and sulfur oxides from stack gas is described. This system consists of three cleaning processes. In the first process, involving a horizontal chimney; solid dusts and sulfur oxides are removed by a spray of an alkali (for example, ammonia) and of water, and the stack gas is precooled. In the second process, a rinsing tower, sulfur oxides are removed by a spray of water with adjusted pH under controlled gas temperature and liquid/gas ratio. In the third process, in a tower which has layers of iron chips, moisture, dust, residual SO₂, hydrogen gas, and sulfur are filtered. Finally the filtered stack gas is diluted with air. With B heavy oil (1 kg), using 0.0125 kg gaseous ammonia and a liquid/gas ratio of 1.5 kg/kg, and 23 kg rinsing water at pH 7, the concentration of SO₂ was reduced to lower than 50 ppm at the exit down from 1500 ppm at the entrance of the system.

58684

APTIC NO. 80340

Kobayashi, I., S. Murase, and H. Taniguchi

TRIAL MODEL OF LOW NOX SMALL BOILER. (*Tei Nox kogata nenshoki no shisaku kekka*). Text in Japanese. *Kikai no kenkyu (Science of Machine)*, 27(7):35-38, July 1975. 7 refs.

The reduction of nitrogen oxides in gas from smaller boilers was studied, emphasizing temperature distribution, lowered average temperature in the combustion chamber, and decreased retention time for NO_x. The first condition is fulfilled by filling the combustion chamber with flame, the second, by releasing heat from the combustion chamber, and the third, by carrying out combustion on the wall. A trial model incinerator was built using a glass cylinder, allowing measurement of combustion chamber temperature distribution. The trial model emitted less NO_x and NO than other models. Just as in other models, 60-80% of the NO_x emitted was NO, and the conversion ratio into NO₂ was around 20-40%. Measurement of infrared radiation showed that there was a good radiation effect when the temperature of the combustion chamber was 800-840 C. When the surplus air coefficient was 2, the concentration of emitted NO_x and NO was around 2 ppm. This is around 0.005 mg/kcal.

58685

APTIC NO. 76262

Kobayashi, Kazuo, Shinjiro Watari, Tsutomu Kato, Minoru Shirashi, and Yoshio Kawana

A MANUFACTURING METHOD FOR HOLLOW SPHERICAL ACTIVATED CARBON. (*Chuku jo kyukei kasaitan no seizoho*). Text in Japanese. (Agency of Industrial Science and Technology (Japan)) Japan. Pat. Sho 50-21433. 3p., July 23, 1975. (Appl. Nov. 15, 1971, 1 claim).

A manufacturing method for hollow spherical activated carbon is described. Various types of coal, pulverized as fine as possible, are mixed thoroughly with hydrophilic bonding agent, such as pitch emulsion. This mixture is shaped into spheres at normal temperature and pressure; organic high polymer materials are used to form the core. Thermoplastic resins are desirable: styrene resin; polyvinyl chloride; polyethylene; methacrylic resins; vinylidene chloride; fluororesins; and foaming plastics. Carbon-coated spheres are dried, heated to a temperature above the melting point of the core, or to its thermal decomposition point. Heating must be effected slowly to allow gentle dissipation of gas upon thermal decomposition. Structural improvement is effected by heating the hollow spheres in a stream of inert gas to the first degree decomposition temperature of carbon, to drive out gas and tar, then sintering at 550 C. Fine holes connect the interior of the sphere with the exterior. The spheres are carbonized in inert gas at 600-1100 C. Both sides of the shell are activated at temperatures above 750 C by passage of steam, carbon monoxide, oxygen, hydrogen, or other reactive gases. In comparison with commercial pelletized active carbon (0.4-1.8 mm in size; 0.47 kg/l packing density; 75% microstrength; 1300 sq cm/g surface in size; 0.47 kg/l packing density; 75% microstrength; 1300 sq

m/g surface to interior ratio), which showed sulfur dioxide adsorption of 10 wt%; hollow spherical active carbon (7-12 mm diameter; 0.274 kg/l packing density; 94% microstrength; 1000 sq m/g surface to interior ratio), showed SO₂ adsorption of 23 wt%.

58686

APTIC NO. 82166

Kobayashi, Nohuyuki, Masahiko Nakada, and Masanori Hanaoka

IGNITION TIMING CONTROL SYSTEM. (Toyota Jidosha Kogyo Kabushiki Kaisha, Aichi-ken (Japan)) U. S. Pat. 3,905,342. 8p., Sept. 16, 1975. 8 refs. (Appl. Jan. 3, 1974, 5 claims).

An ignition timing control system is provided for use with an automotive internal combustion engine having a carburetor, a distributor, a vacuum advance device, and an exhaust gas recirculation system. The ignition timing control system comprises valve means in communication with the intake system upstream and downstream of the carburetor and with the vacuum advance device for controlling a vacuum, to be introduced into the latter, in accordance with the engine operating modes. The vacuum at the absolute level is introduced into the vacuum advance device during acceleration of the automobile to effect such a vacuum advance in the ignition distributor as to allow the exhaust gas recirculation system to minimize the nitrogen oxide content in the engine exhaust gases while minimizing adverse effects upon the operating characteristics of the automobile. The vacuum at such an absolute level is at least partially reduced during cruising and deceleration and introduced into the vacuum advance device to effect a reduction in the vacuum advance such as to allow the exhaust gas recirculation system to minimize the nitrogen content while again minimizing adverse effects upon driving characteristics. (Author abstract modified)

58687

APTIC NO. 83958

Kobayashi, Shigehiko, Kazuhide Miyazaki, and Michiaki Yamamoto

CATALYSTS FOR THE CLEANING OF DISCHARGED GASES CONTAINING CARBON MONOXIDE. (Issanka tanso o funkumu haigasu no jokayo shokubai). Text in Japanese. (Mitsui Mining and Smelting Co., Ltd. (Japan)) Japan. Pat. Sho 50-15758. 7p., June 7, 1974. (Appl. Oct. 14, 1970, 2 claims).

A catalyst which is prepared by adding a powder of copper, iron, or bismuth oxide to a mixture of manganese oxide and lead oxide is described. A 1:1 mixture of manganese oxide and lead oxide was prepared. To this mixture, 20 wt% Cu powder, 30 wt% iron powder, or 15 wt% Bi₂O₃ was added. When a discharged gas carbon monoxide 5%, oxygen 5%, nitrogen 78%, carbon dioxide 9%, hydrocarbons 500 ppm, and others 3% was passed through a pipe filled with catalyst, the CO content of the gas discharged from the pipe was 0 for up to 100 hr. The flow rate of the gas through the pipe was 100 l/min. The inner diameter of the pipe was 50 mm. The 250 g catalyst was pelletized to 6 mm in diameter and 3 mm thick. The temperature of the gas was kept at 400-500 °C. The CO content was determined with a non-diffraction type infrared spectrophotometer. The CO content of the gas leaving the catalyst tube was still less than 0.2% after 200 hr. The manganese oxide may be Mn₂O₃, Mn₃O₄, or natural or chemical MnO₂. The lead oxide may be PbO, Pb₃O₄, PbO₂, or Pb₂O₃.

58688

APTIC NO. 81993

Kobylinksi, Thaddeus P. and Brian W. Taylor

PROCESS FOR REDUCING THE CONTENT OF NITROGEN OXIDES IN A GASEOUS MIXTURE CONTAINING THE SAME. (Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat. 3,907,968. 7p., Sept. 23, 1975. 8 refs. (Appl. Dec. 29, 1972, 18 claims).

A process for the reduction of nitrogen oxides as well as the oxidation of hydrocarbons and carbon monoxide in automobile

AIR POLLUTION ABSTRACTS, JUNE 1976

exhaust is described which utilizes a ruthenate catalyst to overcome problems of volatilization associated with ruthenium metal catalysts. The ruthenate catalyst may consist of lithium, sodium, potassium, rubidium, cesium, calcium, strontium, and barium ruthenates. The first stage ruthenate catalyst can be used for the oxidation of hydrocarbons and carbon monoxide during warm-up prior to its operation in a reducing atmosphere for the control of nitrogen oxides. A second stage catalyst may be employed for the oxidation of hydrocarbons and carbon monoxide after warm-up.

58689

APTIC NO. 82068

Kobylinksi, Tadeusz P. and Brian W. Taylor

CATALYTIC CONVERTER. (Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat. 3,910,770. 7p., Oct. 7, 1975. 9 refs. (Appl. Dec. 23, 1971, 5 claims).

A two-stage converter for both reducing nitrogen oxides and oxidizing carbon monoxide and unburned hydrocarbons in internal combustion engine exhaust is described. It utilizes a monolithic corrugated ceramic catalyst carrier and ruthenium as the catalyst for at least the reduction reaction. Devices with only one bed cannot handle all the different pollutants, and other multiple bed systems consist of relatively complicated metal pipes and cans to achieve multiple surfaces. This large number of metallic walls exposed to the exhaust gases increases the corrosion problem and the problems in packing the catalyst and its carrier into such multiple walled devices, and thus shortens the life of such converters and increases their cost. (Author abstract modified)

58690

APTIC NO. 76117

Koehler, George and James A. Burns

THE MAGNESIA SCRUBBING PROCESS AS APPLIED TO AN OIL-FIRED POWER PLANT (FINAL REPORT). Chemical Construction Corp., New York, Environmental Protection Agency Contract CPA 70-114, Program Element 1AB013, ROAP 21ADA-004, Rept. EPA-600/2-75-057, 266p., Oct. 1975. 30 refs.

A full size demonstration of a magnesia wet scrubbing system for flue gas desulfurization was conducted on an oil-fired, 150 megawatt generating unit. The project involved the design and construction of sulfur dioxide removal system (based on the firing of 2.5% sulfur fuel) and magnesium oxide regeneration facility for 50 ton/day acid production. The system was operated for 4000 hr and successfully removed 90% of the inlet SO₂; it also effectively controlled particulate emissions. Regenerated magnesia was recycled successfully, and over 5000 tons of acid was marketed from the regeneration plant. Correlations were developed to determine SO₂ removal for varying boiler loads and fuel sulfur content and for controlling the regeneration of acceptable alkali. (Author abstract modified)

58691

APTIC NO. 80191

Koehler, G. R. and Klaus Leikert

NEW FLUE GAS DESULFURIZATION METHOD. (Ein neues Verfahren zur Rauchgasentschwefelung). Text in German. Energie (Munich), 27(5):134-137, May 1975.

The magnesia method developed for flue gas desulfurization in power plants, and a pilot plant adopting this method in the USA are described. The flue gases to be desulfurized are admitted into an absorber using hydrated magnesia suspended in water as an absorbent spray liquid. The SO₂ reacts with magnesia to form magnesium sulfite and a small quantity of magnesium sulfate. After droplet separation, the purified flue gas is discharged into the atmosphere, while the adsorbent liquid is recirculated. The liquid to flue gas ratio is 8 liter/cu m. For recovery of magnesium sulfite and sulfate, the spent absorbent liquid is dried and calcined with coke, and the magnesia recovered is recycled within the desulfurization process. The hot flue gases from the calcining oven are dedusted in a cyclone and venturi scrubber, and the SO₂-rich waste gases

are used to produce commercial sulfuric acid. The EPA-sponsored program in the USA involved the Boston Edison Co. power plant in Boston, Mass., and the Potomac Electric Power Company power plant in Baltimore, Md., with a calcium oxide regenerating center at Rumford, R. I.

58692

APTIC NO. 82658

Koenig, Axel

APPARATUS FOR EXHAUST GAS PURIFICATION THROUGH EXHAUST GAS CONVERSION AND EXHAUST GAS RECYCLING. (Volkswagenwerk Aktiengesellschaft, Wolfsburg (Federal Republic of Germany)) U. S. Pat. 3,879,943. 6p., April 29, 1975. 2 refs. (Appl. July 18, 1973, 4 claims).

An apparatus for reducing, by catalytic conversion, the concentration of noxious components in the exhaust gases of an internal combustion engine is described. The apparatus includes a means for removing a portion of the exhaust gases upstream of the catalytic converter for recycling to the combustion chamber of the internal combustion engine. This removal of a portion of the exhaust gases changes the internal air stream characteristics of the catalytic converter, resulting in more efficient operation in comparison to other converters. Recycling of a portion of the exhaust gases serves to lower the combustion chamber temperature of the internal combustion engine, thus reducing the emission of nitrogen oxides. (Author abstract modified)

58693

APTIC NO. 82429

Koepernik, Karl Hermann, Guenter Weidenbach, and Gerhard Koch

CATALYST FOR PURIFYING EXHAUST GASES. (Kali-Chemie Aktiengesellschaft, Hannover (Federal Republic of Germany)) U. S. Pat. 3,894,967. 5p., July 15, 1975. 8 refs. (Appl. Jan. 24, 1974, 17 claims).

The preparation of a catalyst suitable for the catalytic oxidation of the incompletely burned components present in automobile exhaust gases is described. An aluminum oxide carrier having a bulk density of less than 1 kg/l is impregnated with an aqueous solution of an organic manganese salt. The impregnated carrier is calcined a first time between 700 and 1100 C, and saturated with ammonia. The ammonia saturated carrier is impregnated with a noble metal solution and calcined a second time at a temperature between 600 and 800 C. In contrast to other catalysts, this catalyst exhibits improved abrasion resistance and permits more effective oxidation of carbon monoxide and hydrocarbons at lower temperatures utilizing a very low noble metal content. (Author abstract modified)

58694

APTIC NO. 83303

Koester, Herbert

CHEMICAL PLANT WITH RESIDUE INCINERATION AND WASTE HEAT UTILIZATION - NON-POLLUTING AND ECONOMIC COMBINATION. (Chemieanlage mit Rueckstandsverbrennung und Abhitzeverwertung - eine umweltfreundliche und wirtschaftliche Kombination). Text in German. Chem.-Ing.-Tech., 47(10):443, 1975. (The full-length text can be obtained from: Verlag Chemie GmbH, D-6940 Weinheim, Postfach 1260, West Germany).

An environmentally advantageous and economical system for the incineration of gaseous and liquid wastes and for waste heat utilization in compound systems in a petrochemical plant is described. The plant, in which an intermediary product is synthesized from a C4-cut, formaldehyde, and a ketone, is composed of a high-pressure reactor and stripping column, using energy for heating the initial products and steam for the stripping column. The plant generates a wastewater with high organic load, a liquid organic residue, and waste gases with a total energy content of 12.5 Gcal/h. For comparison, the energy requirement of the plant is about 10 Gcal/hr. The liquid and gaseous wastes are incinerated to generate superheated steam at 500 C at a rate of 15 ton/hr. The steam generated is first

used to heat up to the initial products, and, after being expanded to 17 bar, it is used in the technological process in the plant.

58695

APTIC NO. 80124

Kolesnikova, T. A., T. N. Mukhina, S. M. Slutskaya, G. F. Lesokhina, A. P. Rozanova, and V. V. Vorobeva

PRODUCTION OF ELECTRODE COKE FROM PYROLYSIS TARS. Int. Chem. Eng., 15(4):736-737, Oct. 1975.

The pyrolysis of both hydrotreated and dearomatized kerosene/gas oil cuts was investigated. The yield of ethylene from hydrotreated feedstock is 19.5%, propylene 11.0%, and liquid products (pyrolysis tar) 37% on feedstock. The liquid products were distilled to recover a residue distilling above 250 C with a sulfur content of 0.62%. The yield of ethylene from dearomatized feedstock is 24.6%, propylene 12.8%, and liquid products (pyrolysis tar) 34% on feed. The residue contains 0.40% sulfur. Both residual pyrolysis tars were coked under laboratory conditions and in a pilot unit. It is feasible to produce high quality, low sulfur, low ash electrode coke from the sour feedstock.

58696

APTIC NO. 83781

Kolev, Nikolai

MATHEMATICAL MODELS OF PACKED COLUMNS FOR SIMULTANEOUS ABSORPTION OF HYDROGEN SULFIDE AND CARBON DIOXIDE IN AQUEOUS SOLUTIONS OF MONOETHANOLAMINE AT UNIFORM DISTRIBUTION OF GAS AND LIQUID IN APPARATUS CROSS SECTION. (Mathematische Modellierung von Fuehlkoerperkolonnen zur gleichzeitigen Adsorption von Schwefelwasserstoff und Kohlendioxid durch waessrige Loesungen von Monoethanolamin bei gleichmaessiger Verteilung von Gas und Flussigkeit im Apparatequerschnitt). Text in German. Chem.-Ing.-Tech., 47(16):685, 1975. (The full-length text can be obtained from: Verlag Chemie GmbH, D-6940 Weinheim, Postfach 1260, West Germany).

A computerized mathematical model of the simultaneous absorption of hydrogen sulfide and carbon dioxide in aqueous solutions of monoethanolamine in packed columns with uniform gas and liquid distribution over the cross section is described. The model includes differential equations describing the mass balance of the two components, equations to determine the transfer coefficients in gas- and liquid-controlled mass exchange processes, the effective surface of the packing, the influence of the chemical reaction on the rate of absorption of CO₂, and an equation to determine the equilibrium of the system. The concentrations of the components to be absorbed in the gaseous and liquid phases, the H₂S concentration in gaseous phase at the outlet, and the monoethanolamine concentration at the inlet were used as boundary conditions. The mathematical model was verified with a pilot unit, using metal mesh packing of 3200-5000 mm height, a maximal gas flow rate of 3 m/sec and a pressure loss of 180 N/sq m. Good agreement was found between the calculated and experimental values.

58697

APTIC NO. 79628

Kolubajew, Boris

LIQUEFIED GAS AS AN AUTOMOBILE FUEL. A CONTRIBUTION TO ENVIRONMENTAL PROTECTION. (Fahren mit Flussiggas. Ein Beitrag zum Umweltschutz). Text in German. Exakt Inform. Wiss. Tec. Sowjetunion, no. 7/8:48-51, 1975.

Technical features and environmental advantages of the use of liquefied natural gas as an automobile fuel are discussed in the light of recent developments in the USSR and other parts of the world. As compared with gasoline-air mixtures, natural gas-air mixtures are combustible over a wide range of mixing ratios. The environmental advantages of the use of liquefied natural gas as an automobile fuel reside in the near total

absence of air pollutant emissions, such as of hydrocarbons. The carbon monoxide concentrations in the exhaust gas are between 0.1 and 0.2%. Over 35,000 vehicles will be converted to liquefied natural gas combustion in Moscow and other towns of the USSR in the near future.

58698

APTIC NO. 81577

Komatsu, Noboru, Osami Kamigaito, Takatoshi Suzuki, Haruo Doi, Kazuya Sano, Nobuyuki Yamamoto, Toshio Kandori, and Yukikazu Tsuzuki

CATALYST FOR PURIFYING EXHAUST GASES. (Kabushiki Kaisha Toyota Chuo Kenkyusho, Aichi-ken (Japan)) U. S. Pat. 3,900,429. 11p., Aug. 19, 1975. 7 refs. (Appl. Feb. 6, 1974, 18 claims).

A catalyst for converting nitrogen oxides, carbon monoxide, and hydrocarbons present in exhaust gases of internal combustion engines to non-toxic or non-polluting material is described. No known catalyst can convert the NOx present in exhaust gases to non-toxic components efficiently even at high air/fuel ratios and at the same time minimize the production of ammonia. The catalyst consists essentially of a particular mixture of nickel particles and copper particles; Ni particles, Cu particles, and chromium particles; or Ni particles, Cu particles; Cr particles, and an oxide selected from the group consisting of yttrium oxide, titanium dioxide, lanthanum oxide, and mixtures thereof. The particulate mixture is sintered and at least partially oxidized. (Author abstract modified)

58699

APTIC NO. 82134

Kondo, Masatoshi

NOX PREVENTIVE METHOD BY EMISSION GAS PURIFICATION AND SEPARATION METHOD UTILIZING ULTRASONIC WAVES. (Choonpa riyu haigasu joka bunriho ni yoru NOx boshiho). Text in Japanese. Nenryo oyobi Nenryo (Fuel and Combustion), 42(12):1073-1087, Dec. 1975. 9 refs.

An ultrasonic wave emission gas purification method for removal of nitrogen oxides is described. The technology for removal of nitrogen oxides contained in emission gas is still being developed, and only a few methods are ready for utilization. However legal standardization of NOx removal processes is imminent. Ultrasonic gas purification can be classified as a dry type catalytic reduction method, which achieves 100% efficiency in recovering not only NOx but also sulfur dioxide without any residual products resulting from the process. The active catalysts are always active and there is no need for regeneration of the catalysts. Activated carbon is used as the catalyst, the adsorbent material, and the filler in the filler layers. The technology for utilizing ultrasonic energy is discussed in terms of the following details: various volumes of ultrasonic waves, destruction of ultrasonic wave energy, the vibrating element of the ultrasonic wave, chemical reactions of ultrasonic waves, mechanical destruction theory, sonoluminescence by application of ultrasonic wave, and the influence on absorption of NOx.

58700

APTIC NO. 82308

Konishi, Jinemon

ANTI-POLLUTION EXHAUST APPARATUS. (Assignee not given.) U. S. Pat. 3,890,103. 13p., June 17, 1975. 27 refs. (Appl. Aug. 23, 1972, 7 claims).

A process that employs centrifugal separation, ionization, and liquid washing to remove particulates from chimney exhaust gases is described. The contaminated gas is introduced into the bottom of an exhaust conduit whose inner diameter increases in direct proportion to its height. The inner surface of the exhaust conduit is configured to impart a swirling motion to the vertically ascending hot gas, and the centrifugal force in the swirling gas causes heavy matter in the gas to impinge on the inner surface of the chimney. Particulate matter in the gas is ionized by a corona discharge and is subsequently collected on a positive electrode. The collection means are washed with a

AIR POLLUTION ABSTRACTS, JUNE 1976

fluid to remove the collected particulate matter. Alternatively, the collected particulate matter may be neutralized by a chemical reaction. (Author summary modified)

58701

APTIC NO. 83093

Konishi, Tsutomu

ON THE PLASTIC WET TYPE ELECTRIC DUST COLLECTOR. (Purasutikku sei shishiki denki shojin sochi ni tsuite). Text in Japanese. Boira Gishi (Boilermen), 30(10):874-881, Oct. 1975.

The all plastic wet type of electric dust collector of Tochu Plastic Industries is designed to collect dust, soot, and harmful mist exhausted from plant boilers. Recently various plastic electric dust collectors are being developed because of the anti-corrosive characteristics of plastic material. However, the heart of the electric dust collector, electrode plates for collecting dust, cannot be made of plastic material unless the plastic material is improved to qualify for the structure and the electric characteristic of the electrode plates. The utility model all plastic wet type electric dust collector, plastic electrode plates for collection of dust, and failures and repair works are discussed. The future of plastic electric dust collectors is hopeful if they are operated according to the directions, because plastic is light and anti-corrosive. Thermal plastic and thermal hardening resin base material for electrode plates must be improved and carefully selected according to the requirements of dust collectors.

58702

APTIC NO. 82601

Koppang, R. R.

POLLUTION CONTROL EQUIPMENT AND TECHNOLOGY. BROADER AVAILABILITY OF ELECTROSTATIC PRECIPITATORS - A NEW HYBRID EP CONCEPT, THE TRW CHARGED DROPLET SCRUBBER. Preprint, TRW Inc., Redondo Beach, Calif., Environmental Products Development and Applications Div., 17p., 1975. (Presented at the International Pollution Engineering Congress, 4th, Cleveland, Ohio, Oct. 20-23, 1975.)

A unique hybrid electrostatic precipitator known as the Charged Droplet Scrubber is described. The device combines high energy wet scrubbing collection of micron-sized particulates with electrostatic precipitation collection of submicron particulates. The gas cleaning process steps of water droplet atomization, acceleration, particulate collection, and demisting are performed through applied principles of electrostatics within a gas treatment length of 8 ft. The apparatus features the size advantage of wet scrubbers and the low energy consumption characteristics of electrostatic precipitators. Other operating advantages include: no moving parts in the gas stream, low sensitivity to particulate physical properties, and low liquid-to-gas ratios. Particulate collection efficiencies exceeding 99% for micron-sized particles and 95% for submicron particles are obtainable. Charged Droplet Scrubber equipment is available in modular, prefabricated structures with up to 100,000 cu ft/min nominal capacity. (Author abstract modified)

58703

APTIC NO. 82653

Koppang, Richard R., Harland L. Burge, Jr., Wallace A. Carter, and Ellis W. Sheffield

BURNER ASSEMBLY FOR PROVIDING REDUCED EMISSION OF AIR POLLUTANT. (TRW Inc., Redondo Beach, Calif.) U. S. Pat. 3,880,571. 12p., April 29, 1975. 5 refs.

A burner assembly used for the combustion of fossil and manufactured fuels was developed which reduces air pollution emissions. There is an improved mixing of the reactant in the external mixing zone which is an improvement over other assemblies. Air or any gaseous oxidizer exiting from the annular flow path is intercepted by a fuel exiting from the radial orifices. Mixing occurs as a result of an exchange of momentum between the reactant streams and an aerodynamically formed

CONTROL METHODS

screen effect. Combustion is enhanced by several parameters which relate both to the dynamics of combustion and to the physical dimensions of the burner. Nitric oxide is reduced by sufficiently reducing the time during which oxygen is exposed to the nitrogen molecule or nitrogen atom.

58704

APTIC NO. 83365

Koshigami, Kunio, Hiroshi Kobayashi, Toru Sente, and Kochi Sugiyama

METHOD FOR INCINERATING INDUSTRIAL WASTAGE. (Babcock-Hitachi K.K., Tokyo (Japan)) U. S. Pat. 3,888,194. 6p., June 10, 1975. 6 refs. (Appl. Feb. 28, 1974, 7 claims).

A method for incinerating combustible industrial wastage containing organic nitrogen compounds of peptide bond or cyan radical by using fluidized bed incineration is described. The wastage together with combustible materials abundant in carbon content, such as pulverized coal or heavy oil, is supplied to the fluidized bed to maintain the interior of the bed in a reductive atmosphere. The nitrogen oxide produced from the combustion of the waste is reduced and removed as nitrogen from the waste or stack gas. (Author abstract modified)

58705

APTIC NO. 76572

Koshizuka, Katsuo

SOX GAS REMOVAL IN THE ALPHA-Fe₂O₃ PRODUCTION PROCESS. (Alpha-Fe₂O₃ no seizo katei ni okeru XOX gasu no jyokyo). Text in Japanese. Preprint, Japan Society of Powder and Powder Metallurgy, Kyoto, p. 56-59, 1975. (Presented at the Ferrite Summer Seminar, 6th, Tokyo, Aug. 19-20, 1975.)

During the production of alpha-ferric oxide from ferrous sulfate by thermal decomposition, a large amount of sulfur oxides are produced. A desulfurization system used for the treatment of sulfur dioxide and sulfur trioxide produced in the alpha-Fe₂O₃ process is described. The system consists of an exhaust gas cooling tower (from 250 C to 50 C), a removal device for SO₃ fume (wet Cottrell), a first SO₂ absorption tower (water), a second SO₂ absorption tower (water), and a desulfurization waste water treatment device. Removal efficiencies of this system were above 98% for SO₃ (initial concentration 3070 ppm), 80% for SO₂ (initial concentration 3500 ppm) in the first absorption tower, and 92.9% for SO₂ in the second absorption tower, and the overall SO₂ removal rate was 98.6%. The equipment cost was about \$300,000 (constructed in 1969), and the present running cost is about \$4000/month.

58706

APTIC NO. 83582

Krautwurst, Homer V. and Cristian F. Schultz

TANK FILL VAPOR CONTROL. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,884,204. 6p., May 20, 1975. 3 refs. (Appl. April 15, 1974, 3 claims).

An improved two-canister evaporative emission control system for collecting fuel vapors from a fuel supply system for vehicles is described. It includes a first small capacity canister to collect vapors generated within a fuel tank and from a fuel bowl of the carburetor during engine operation. The collected vapors are purged from the small canister during each engine operation to condition the canister for subsequent collection of vapors generated from the tank and carburetor bowl. The vapors are directed from the tank into a second larger-volume canister during a fuel fill phase of operation without passage of additional vapors into the smaller canister. The larger-volume canister is purged into the intake manifold of the engine at a lesser rate than the purge rate from the first canister, to avoid adverse engine operation or increased exhaust emission of unburned hydrocarbons from the engine during its operation.

58710

APTIC NO. 81742

58707

Kravitz, Stanley N. and Jintendra A. Patel

HYDRODESULFURIZATION OF HEAVY PETROLEUM OIL AT HIGHER TEMPERATURES AND SPACE VELOCITIES. (Texaco Inc., New York) U. S. Pat. 3,912,621. 4p., Oct. 14, 1975. 6 refs. (Appl. Dec. 7, 1973, 6 claims).

A method is claimed for effecting at least 90% desulfurization of a petroleum oil having an initial boiling point of at least 625 F. The heavy hydrocarbon oils are desulfurized with minimum hydrogen consumption by being contacted with a hydrodesulfurization catalyst under desulfurization conditions including a temperature between 750 F and 850 F and a space velocity between 3 and 10 v/v/hr. The catalyst comprises an iron group metal or an oxide or sulfide of an iron group metal and a Group VI-B metal or an oxide or sulfide of a Group VI-B metal on alumina containing 2 to 15 wt% silica. The catalyst is used as a fixed bed of particles which may be in the form of spheroids, pellets, or cylindroids. The reactant flow through the catalyst bed is concurrent and may be either up or down. The hydrogen should have a purity of at least 50% and preferably at least 65% by volume. (Author abstract modified)

58708

APTIC NO. 83669

Kroetzsch, P.

WASTE GAS CLEANING BY CHEMISORPTION BY MEANS OF JET SCRUBBERS, AS EXEMPLIFIED BY CHLORINE ABSORPTION IN AQUEOUS SODIUM THIOSULFATE SOLUTION. (Abgasreinigung durch Chemisorption mittels Strahlwaeschern am Beispiel der Cl₂-Absorption in waessriger Natriumthiosulfatloesung). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 232:249-257, 1975. 8 refs.

Studies on the hydrodynamics and mass exchange process in connection with the chemisorption of gaseous chlorine in a jet scrubber using aqueous sodium thiosulfate solution are described along with preliminary results of pilot tests. The scrubbing liquid temperature was 85 C, the gas temperature 25 C, and the reaction temperature was 63 C. Chlorine reacts with sodium thiosulfate, and sodium sulfate, elemental sulfur, and hydrochloric acid are obtained as reaction products.

58709

APTIC NO. 83974

Kroetzsch, Peter

WASTE GAS CLEANING BY CHEMISORPTION IN JET SCRUBBERS AS EXEMPLIFIED BY CL₂-ABSORPTION IN AQUEOUS SODIUM THIOSULFATE SOLUTION. (Abgasreinigung durch Chemisorption mittels Strahlwaeschern am Beispiel der Cl₂-Absorption in waessriger Natriumthiosulfat-Loesung). Text in German. Chem.-Ing.-Tech., 47(5):213, 1975. 1 ref. (The full-length text can be obtained from Verlag Chemie GmbH, D-6940 Weinheim, Postfach 1260, West Germany).

Waste gas cleaning by chemisorption in jet scrubbers was investigated by chlorine absorption in an aqueous sodium thiosulfate solution. The Hoffmann, Kuerten, and Nagel measurements and formula governing the exchange surface in jet scrubbers was successfully used to explain the experimental data. With chemisorption the transition number of the liquid phase is generally dependent on the concentration of the reactant, contact time, and the diffusion coefficient of the reactant. A graph of chlorine concentration at the laminar jet of the jet chamber and pure gaseous chlorine content shows a bent curve in the beginning, which straightens out after a short distance, indicating a fast reaction of the second order. The reaction constants belonging to the curve are dependent on the molar thiosulfate concentration.

58710

APTIC NO. 83097

Kruis, August and Heinz Karwat

EXTRACTION OF ODORIZING SULFUR COMPOUNDS FROM NATURAL GAS AND REODORIZATION

107

THEREWITH. (Linde A. G. Zentrale Patentabteilung, Munich (Federal Republic of Germany)) U. S. Pat. 3,899,312. 8p., Aug. 12, 1975. 9 refs. (Appl. Aug. 18, 1970, 17 claims).

The invention makes it possible to remove the odorizing organic sulfur compounds accompanying natural gas from its source and to recycle them to the stored liquefied natural gas after reevaporation. The natural gas is first scrubbed with a polar organic scrubbing agent such as methanol. Water and liquid hydrocarbons are added to the loaded scrubbing agent in a separating step. A practically complete removal of the organic sulfur compounds from the aqueous scrubbing agent phase is obtained. The resultant hydrocarbon phase is then used to odorize the natural gas. (Author abstract modified)

58711

APTIC NO. 80190

Kruppe, Herbert, Egon Piski, and Karl-Heinz de Jong

POWER PLANT VERSUS THE ENVIRONMENT.

(Kraftwerk und Umwelt). Text in German. TUE (Tech. Ueberwach.), 16(7/8):222-226, July/Aug. 1975. 31 refs. (Presented at the Power Plant and Environment Conference, Essen, West Germany, March 12-13, 1975.)

General problems of air pollution, thermal pollution, and noise emissions at thermal power plants are discussed, and possible solutions to these environmental problems are pointed out. While nuclear power plants are less hazardous environmentally than conventional thermal power plants, thermal pollution is a common feature of both types. The waste heat should be used for remote heating purposes to prevent thermal pollution. Therefore, the federal government of West Germany has earmarked huge sums for remote heating systems projects in the Ruhr and Saar districts. Remote heating systems could save 80,000,000 tons of coal annually, which is equivalent to yearly production of the West German coal mining industry. The waste heat lost in cooling towers could be used to heat farmlands and fish ponds, according to a proposal being studied by the Federal Ministry for Research. Fuel and flue gas desulfurization studies are also sponsored at the federal level.

58712

APTIC NO. 82164

Kubota, Takeshi and Mikio Ueda

PROCESS OF PREPARING DESULFURIZED LIGHT OIL AND FUEL GAS FROM HEAVY OIL. (Mitsui Shipbuilding and Engineering Co., Ltd., Tokyo (Japan)) U. S. Pat. 3,907,662. 8p., Sept. 23, 1975. 5 refs. (Appl. Feb. 14, 1974, 4 claims).

A process is provided for preparing desulfurized light oil and fuel gas from heavy oil by using an alkali metal carbonate compound and gasifying the resulting coke. A coking reactor operates between 470 and 550 C and includes a fluidized bed containing particles of an alkali metal carbonate compound. This reactor converts heavy oil into particles of carbonaceous residue containing desulfurized decomposition gas, desulfurized light oil, particles of the alkali metal carbonate compound, and volatile components. A portion of the sulfur contained in the heavy oil is fixed to form an alkali metal sulfide by the action of the alkali metal carbonate compound so as to recover the desulfurized decomposition gas and the desulfurized light oil from the raw temperature coking reactor.

58713

APTIC NO. 82302

Kaufman, Arnold S. and Albert Sweet

EXHAUST HOOD. (Elsters, Inc., Hollywood, Calif.) U. S. Pat. 3,890,887. 6p., June 24, 1975. 4 refs. (Appl. Jan. 16, 1974, 4 claims).

An exhaust hood designed for the removal of smoke and odors from cooking areas is described which provides for fresh air ventilation not only in the area where the cook is working but also in areas where other personnel may be stationed. A ventilation door which is located on the front of the hood functions in cooperation with a source of temperature-controlled fresh air such that the air is directed toward the cooking sur-

AIR POLLUTION ABSTRACTS, JUNE 1976

face when the ventilation door is in one position. Air may be directed both outward and downward in front of the exhaust hood when the ventilation door is in a second position. (Author summary modified)

58714

APTIC NO. 79666

Kummer, J. T.

LABORATORY EXPERIMENTS EVALUATING THE EFFECTS OF S AND CU ON A PT-AL₂O₃ AUTO EXHAUST OXIDATION CATALYSTS. J. Catalysis, 38(1-3):166-171, June 23, 1975. 1 ref.

The effects of sulfur and copper on a platinum-alumina auto exhaust oxidation catalysts were evaluated. Copper impregnation substantially increases the ethylene oxidation activity in a laboratory gas stream of a Pt-Al₂O₃ catalyst, while it decreases carbon monoxide oxidation activity. Sulfur dioxide decreases the activity of untreated Pt-Al₂O₃ catalyst for both CO and C₂H₄ oxidation. The Cu-treated Pt-Al₂O₃ catalyst shows a decrease in ethylene oxidation activity due to SO₂ about equal to or less than the untreated catalyst, whereas the Cu-treated catalyst shows a larger decrease in CO oxidation activity due to SO₂ than the untreated material. Reduction of the CU treated catalyst greatly increases the CO activity and decreases the ethylene activity. (Author abstract modified)

58715

APTIC NO. 76603

Kunciewicz, Leszek

THE ACOUSTIC PROPERTIES OF FILTER CLOTH.

(Die akustischen Eigenschaften von Filtergeweben). Text in German. Staub, Reinhaltung Luft, 35(10):366-369, 1975. 6 refs.

Filter cloths have acoustic properties which depend on their internal structure. The relationship between the sound attenuation, that is, the average difference between the values for the acoustic pressure of a transmitter and a receiver at different frequencies, and the porosity or air permeability of different filter materials (easily measurable by conventional methods) is discussed. The comparison of the sound attenuation and air permeability for modulated tones gives a correlation value of -0.7718, for porosity and sound attenuation +0.338. When background noise is used, the value is 0.7870.

58716

APTIC NO. 82099

Kunin, Robert

REMOVAL OF SULFUR DIOXIDE AND/OR TRIOXIDE FROM GASEOUS EFFLUENTS OF FOSSIL FUEL OPERATED POWER AND STEAM PLANTS. (Rohm and Haas Co., Philadelphia, Pa.) U. S. Pat. 3,916,025. 5p., Oct. 28, 1975. 3 refs. (Appl. March 14, 1973, 6 claims).

A unique and novel ion exchange resin system for removing sulfur dioxide and sulfur trioxide from the stack gases of fossil fuel burning operations is described. The process is based upon the reaction between the salt form of a weak acid cation exchange resin and SO₂ and/or SO₃ in the presence of water vapor and oxygen to form acid sulfite and sulfate salts within the pore structure of the ion exchange resin. The acid sulfite and sulfate salts are eluted from the ion exchanger with water and treated with a stoichiometric quantity of lime to recover alkali with which to regenerate the ion exchange resin. The SO₂ is fixed and recovered as insoluble calcium sulfate (gypsum). The ion exchange resin system removed more than 90% of the SO₂ and SO₃ and has the advantages of extremely high capacity and high flow rate capability. It consumes only 1 mole of calcium oxide/mole of SO₂ removed. Alternatively, the sulfite containing eluate can be processed to produce elemental sulfur or sulfuric acid. The novel ion exchange system also removes significant amounts of the acidic oxides of nitrogen. This process is a low cost and reliable system for removing SO₂ without the need to market a by-product whose true market value might be questionable from time to time.

58717

APTIC NO. 80086

Kurahashi, Y. and K. Matsumoto

UTILIZATION OF ALKALI WASTEWATER NEUTRALIZATION EQUIPMENT FOR FLUE GAS DESULFURIZATION. (*Haiei datsuryuyo arukari haieki chuwa sochi riyo no jissai ni tsuite*). Text in Japanese. *Kako Gijutsu (Process. Tech.)*, 10(9):566, Sept. 1975.

The utilization of alkali waste water from textile industries for flue gas desulfurization is described. The wastewater from the bleaching process and other processes which produce high alkali waste solutions could be used as the absorbing solution in a wet type flue gas desulfurization process. The pH adjustment of the wastewater would be simultaneously possible. Wastewater fed into a desulfurization process had a pH of 10 to 11.5 and the output water from the process had a pH of 7 to 8. The chemical oxygen demand of the output water became higher (1000-1500 ppm) as the formation of sodium sulfite, sodium hydrogen sulfite, and suspended substances (SS) increased because of the dust and soot components in the flue gas; further treatment of COD and SS removal were essential. This could be done by mixing in wastewater generated from other non-alkali producing processes, which could then be treated by a coagulation method, a filtration method, or other methods before being discharged into public drainage. The running cost for flue gas desulfurization could be much lower using alkali wastewater. It costs 50 cents/kl heavy oil for a factory emitting 5500 N cu m flue gas/hr and generating 320 to 400 cu m of alkali waste water/hr (pH 10 to 11.5), compared to \$14/kl heavy oil for a factory emitting 1900 N cu m flue gas/hr and generating no alkali wastewater, in which the use of fresh NaOH was required for flue gas desulfurization.

58718

APTIC NO. 82048

Kuroda, Osamu

SYSTEM FOR CLEANING EXHAUST GASES FROM AN INTERNAL COMBUSTION ENGINE. (*Toyota Hidoshia Kogyo Kabushiki, Kaisha (Japan)*) U. S. Pat. 3,908,370. 7p., Sept. 30, 1975. 2 refs. (Appl. July 25, 1974, 4 claims).

A system for cleaning exhaust gases from an internal combustion engine is described. It includes a valve for introducing the flow of air into the exhaust manifold in order to burn the unburnt component in the exhaust gases or for releasing the flow of air into the atmosphere, by the action of negative pressure within the intake manifold. In other systems the flow of air is released into the atmosphere only through one passage, while in the present system the flow of air is released into the atmosphere through two passages. This decreases the noise which is a problem in the one-passages systems.

58719

APTIC NO. 82135

Kurosawa, Keiji

ENGINEERING OF STACK GAS DESULFURIZATION, DENITRATION AND REGULATION OF TOTAL EMISSION. (*Haiei datsuryu, dasho gijutsu to soryo kisei*). Text in Japanese. *Nenryo oyobi Nensho (Fuel and Combustion)*, 42(12):1097-1108, Dec. 1975.

A partial revision of the Air Pollution Control Law implemented in June 1974 regulates the total emission of sulfur oxides and has a stricter emission coefficient value. The finalized emission coefficient related to SOx was announced on April 15, 1975. In order to meet these regulations, desulfurization technology has now reached the utilization period, and presently operating desulfurization processes have a total gas treating capacity of 40,000,000 N cu m/hr. At this time a further gas treating capacity of 20,000,000 N cu m/hr are also being constructed. However, denitration technology is lagging behind and is still in the process of being developed. The costs for desulfurization and denitration processes are extremely high, and the low sulfur heavy oil supply was only one third of the total heavy oil supply in 1974. Emission control for the protection of the environment must be approached not only by desulfurization/denitration processes but also by selection of

fuels depending upon favorable economical aspects at each plant and application.

58720

APTIC NO. 80040

Kushiyama, Satoshi

PRESENT STATUS OF TECHNIQUES FOR PREVENTING NITROGEN OXIDES EMISSIONS FROM STATIONARY SOURCES. (*Chisso sankabutsu no bojo gijutsu kenkyu kaihatsu no genjo to tenbo*). Text in Japanese. *Kogai to Taisaku (J. Pollution Control)*, 11(10):1100-1106, 1975. 18 refs.

The present status of nitrogen oxides emission control techniques for stationary sources is reviewed. The low NOx burner, two-stage combustion, exhaust gas recirculation, off stoichiometric combustion, water-steam injection, air resistor opening control and low excessive air combustion are discussed. Conversion to higher quality fuel is discussed with reference to fuel refining techniques and nitrogen content reduction methods. Denitrification is discussed with descriptions of wet and dry denitrification processes. Among these NOx emission control techniques, the low NOx burner and the ammonia reduction denitrification processes for boiler exhaust gas with relatively low dust content are considered to have reached to the stage of practical application. Important subjects for future research and techniques needing future development are also discussed.

58721

APTIC NO. 79753

Kvashnin, N. P. and Y. N. Bakhareva

THERMAL DEODORIZATION OF HARMFUL GASES IN THE PRODUCTION OF SYNTHETIC FAT SUBSTITUENTS. (*Termicheskaya dezodoratsiya vrednykh gazov SZhK*). Text in Russian. *Neftepererab. Neftekhim.*, no. 4:44-45, 1975.

A method for the incineration of malodorous, toxic waste gases generated in the production of synthetic fat substituents is described. Incineration is done in a two-stage cyclone type unit, with a first stage used for the combustion of auxiliary fuel. The flame generated in the first stage, with a temperature of between 1700 and 1800 C, is admitted to the second stage in which the waste gas to be deodorized is admitted tangentially. Complete combustion to carbon dioxide and water is achieved due to the intense mass and heat transfer and to the intense turbulence.

58722

APTIC NO. 79761

Kydd, P. H.

CONSERVATION OF ENERGY: INTEGRATED GASIFICATION GAS TURBINE CYCLES. *Chem. Eng. Prog.*, 71(10):62-68, Oct. 1975. 8 refs.

The integrated coal gasifier-gas cleaning plant-gas turbine combined cycle power plant is discussed. The methods by which gas turbine cycle performance is calculated are discussed and applied to an integrated gasifier-gas turbine cycle. Integrating a gasification system increases efficiency from 73% to 85.5%. Overall cycle efficiency can go up from 34.3% to 43%. Improved gas turbine efficiency has a double effect in improving the integrated cycle. It reduces coal consumption and operating costs and reduces the capacity of the gasification and gas cleaning equipment required for a given kilowatt rating. Low B.t.u. gasification provides an unlimited source of clean fuel which allows the gas turbine to reach its full potential.

58723

APTIC NO. 83227

Lenane, Denis L.

FILTER ELEMENT. (*Ethyl Corp., Richmond, Va.*) U. S. Pat. 3,871,850. 5p., March 18, 1975. 9 refs. (Appl. March 20, 1973, 1 claim).

A filter element adapted to remove fine particulates from the exhaust gas of internal combustion engines is described. It consists of a non-woven fiber mat bonded to a wire mesh. The

preferred fiber mat is an aromatic polyamide such as poly(m-phenyleneisophthalamide) fiber mats. (Author abstract modified)

58724

APTIC NO. 82911

La Haye, Paul G. and John W. Bjerklie

ATOMIZING METHOD AND APPARATUS. (Aqua-Chem, Inc., Milwaukee, Wis.) U. S. Pat. 3,876,363. 18p., April 8, 1975. 3 refs. (Appl. Jan. 2, 1974, 37 claims).

A method and apparatus for finely atomizing liquids by employing energy stored within the liquid in the form of an emulsion is described. Unlike in conventional systems, heavier fuels, such as no. 6 fuel oil or residual fuels, can readily be vaporized prior to combustion. The system includes producing an emulsion of the oil with a secondary fluid pressurizing and heating the emulsion to a level below the vaporizing point of the secondary fluid and the constituents of the primary fluid. The resulting heated and pressurized emulsion is released to a lower pressure to vaporize the secondary fluid and the light ends of the primary fluid thereby subdividing the primary fluid or all into fine or small drops. When used to atomize fuel oils for combustions, the subdivided oil may be premixed with air or a mixture of air, carbon dioxide, and other gases permitting a substantial reduction in the emission of particulate matter and noxious products. (Author abstract modified)

58725

APTIC NO. 83747

La Haye, Paul G.

REDUCTION OF POLLUTANTS IN GASEOUS HYDROCARBON COMBUSTION PRODUCTS. (Aqua-Chem, Inc., Milwaukee, Wis.) U. S. Pat. 3,885,903. 8p., May 27, 1975. 2 refs. (Appl. Oct. 30, 1972, 19 claims).

A method and apparatus for reducing air polluting agents such as nitrogen oxides, carbon monoxide, carbonaceous particulates, and unburned hydrocarbons in the exhaust gases of carbonaceous and hydrocarbon fuel burners are described. Fuel and less than the amount of air for stoichiometric combustion are injected into a combustion chamber so that the fuel rich mixture burns as a core in the combustion chamber. The balance of the air for substantially stoichiometric combustion is injected coaxially and rotationally as a sheath or vortex which surrounds the core. Where the core is hot and rich, there is little mixing of the sheath air and core gases and the available oxygen combines preferentially with fuel components other than nitrogen so that little nitrogen oxides are produced. After some heat is extracted from the gases in the core, more complex mixing of the sheath air and core gases occurs. Under these lean and cool combustion conditions, production of NOx is low. (Author abstract modified)

58726

APTIC NO. 82407

Laessig, Rudolf R.

VAPOR GENERATOR. (General Electric Co., New York) U. S. Pat. 3,899,031. 4p., Aug. 12, 1975. 4 refs. (Appl. June 17, 1974, 4 claims).

An improved vapor generator is described which has low pollutant emission characteristics and is less complicated than other devices. A porous burner having a cooling liquid tube within it divides the interior of a housing into a combustion chamber and a plenum into which the combustible mixture is blown. The vaporized mixture passes through the wall and burns on its outer surface. In a coiled tube surrounding the porous burner the liquid from the cooling liquid tube is vaporized. Only about 10 ppm of unburned hydrocarbons are found in the exhaust, together with approximately 10 ppm nitrogen oxides, and 0.075% carbon monoxide.

58727

APTIC NO. 80292

Lamb, A. N.

VARIATIONS IN THE PERFORMANCE OF ELECTROSTATIC PRECIPITATORS COLLECTING FLY ASH FROM LARGE BOILERS. *The Clean Air Society of*

AIR POLLUTION ABSTRACTS, JUNE 1976

Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 176-198. 7 refs. (Feb. 17-21.)

Variations in the performance of electrostatic precipitators collecting fly ash from large boilers at power plants throughout Australia are discussed. Fly ash emissions measured over a 12-month period varied from 0.1-0.4 g/normal cu m. Variations in fuel, combustion conditions, pulverizing mill wear, and atmospheric conditions along with variations within the precipitators such as changes in the thickness of the residual dust layer after rapping influenced precipitator performance. Precipitator collection efficiencies ranged from 97.4-99.7% and were generally adequate for the control of fly ash emissions to required limits.

58728

APTIC NO. 75974

Lamb, T. J., R. H. Stephens, C. M. Mohr, P. C. Levins, L. K. Fox, and A. F. Sarofim

INCINERATOR OVERFIRE MIXING DEMONSTRATION (FINAL REPORT). Little (Arthur D.), Inc., Cambridge, Mass., Environmental Protection Agency Contract 68-02-0204, Program Element 1AB015, ROAP 21AUZ-015, Rept. EPA-600/2-75-016, ADL-73722, 158p., Aug. 1975. 8 refs.

NTIS: PB 245015/AS

An overfire mixing system was installed on an existing municipal incinerator and evaluated in terms of its effects on combustible pollutant emissions. Overfire jets reduced the emission of combustible pollutants such as carbon monoxide, hydrogen, hydrocarbons, and soot resulting from mixing limitations; however, they are ineffective in reducing combustible emissions due to quenching. The latter appeared to be more amenable to control through proper furnace design and underfire air control. Sidewall overfire jets were very effective in controlling the temperature of the overfire region.

58729

APTIC NO. 82044

Lamma, Heinz

ROTARY PISTON INTERNAL COMBUSTION ENGINE. (Daimler-Benz Aktiengesellschaft (Federal Republic of Germany)) U. S. Pat. 3,908,612. 7p., Sept. 30, 1975. 7 refs. (Appl. March 28, 1974, 24 claims).

An improved lubricating system for an improved rotary piston internal combustion engine is described. The shaft of the throttle is provided with an oil channel extending in the longitudinal direction of the shaft and terminating in a cross bore extending through the shaft. The cross bore is inclined at an angle of approximately 40 deg with respect to the plane of the valve member, so as to optimize lubricant supply for all engine operating conditions. This system overcomes the problems associated with other systems in which the delivery and distribution of the additional oil takes place with a carburetor operation or with an injection operation when a metered oil quantity is supplied wall bound to the wall of the inlet channel and/or to the casing running surface of the engine. With the carburetor operation system, the lubricating capability of the oil does not fully satisfy the lubricating requirement and a part of the oil participates in the combustion. With injection operation systems, the oil is provided intermittently after a predetermined number of rotations of the engine piston so that a uniform lubrication during every rotation of the piston does not take place.

58730

APTIC NO. 82929

Lange, K. Robert and Yuan Tsun Hsu

METHOD FOR SCRUBBING GASES DERIVED FROM BLAST FURNACES. (Betz Labs. Inc., Trevose, Pa.) U. S. Pat. 3,880,620. 4p., April 29, 1975. 1 ref. (Appl. June 19, 1974, 6 claims).

A method of controlling ferric oxide deposition during the scrubbing of waste flue gases derived from blast furnace iron producing operations is described. The flue gases are sprayed with an aqueous medium containing the combination compris-

CONTROL METHODS

58736

ing in a weight ratio basis of 1:10 to 10:1 of an acrylic acid polymer having an average molecular weight of from about 750 to about 1000, 100,000 and a specified organophosphonate. (Author abstract modified)

58731

APTIC NO. 82990

Larsson, Bertil Sven Vilhelm

APPARATUS FOR SEPARATING PARTICULATE MATTER FROM A FLOWING MEDIUM. (Aktiebolaget Svenska Flaktfabriken, Nacha (Sweden)) U. S. Pat. 3,874,860. 4p., April 1, 1975. 11 refs. (Appl. March 29, 1973, 5 claims).

An apparatus for separating the waste material from the pneumatic conveying medium is described which is particularly applicable to systems for large buildings where the waste is transported away pneumatically. The separator is in two stages; the first stage is a conventional separator, and the second stage is a wet separator for fine material. The separated fine material is discharged intermittently from the second separator through the first separator. The entire system is run from a single fan unit located downstream of the second separator for generating a suction in the separators as well as in the entire pneumatic waste disposal system. The same suction is used to withdraw the fine separated material from the second separator into the first separator. During the period when the material is discharged from the second separator, outside air is introduced into the separated fine material at a point midway between the top and the bottom of the collected fine material. Conventional equipment requires shutdown of the installation and cleaning of the fine separator which is time consuming and unhygienic. This arrangement eliminates these disadvantages. (Author abstract modified)

58732

APTIC NO. 83551

Lauer, K. R. and R. M. Leliaert

A RESEARCH PROGRAM FOR PROFITABLE UTILIZATION OF INCINERATOR RESIDUE FROM MUNICIPAL REFUSE. Notre Dame Univ., Ind. and Wheelabrator-Frye, Inc., Mishawaka, Ind., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 360-365. 7 refs. (Nov. 3-5.)

The residue remaining from the incineration of municipal refuse was evaluated as a potential aggregate source. American Society of Testing and Materials acceptance tests show potential as subbase and base course material and aggregate for portland cement and asphaltic concrete. A CBR value of 60 is attained when the material is compacted at optimum moisture content. Portland cement concrete strengths in the order of 2750 bar are possible. Alkali aggregate reactions cause expansion but it appears that it can be controlled. An asphaltic mix meeting high quality criteria was designed on the basis of the Marshall method. (Author summary modified)

58733

APTIC NO. 76413

Le Dinh, Pierre H.

WASTE GAS CLEANING IN THE SUGAR BEET INDUSTRY. (L'épuration des effluents gazeux dans l'industrie du sucre de betterave). Text in French. Inform. Chim., no. 145:269-276, June 1975. 5 refs.

Problems and possibilities of waste gas cleaning in the French sugar industry are described. Pulp driers, lime kilns, and material handling are the chief sources of air pollutant emissions in sugar production from sugar beets. The dust content of beet pulp drier-generated waste gases is separated at high efficiency by means of DB model tubular venturi scrubbers in which the waste gases are admitted to the scrubbing water bath through a conically tapered ring gap, and entrain water droplets due to their kinetic energy. Droplet separation is done by means of fixed cones in the top part of the scrubber. The dust is separated from lime kiln flue gases at practically 100% efficiency at a pressure loss of 200 mm of water column. Similarly high efficiency can be reached in the case of using

such scrubbers for the separation of sugar from waste gases generated in sugar drying and handling operations.

58734

APTIC NO. 83678

Le Govic, V.

DUST CONTROL IN QUARRIES. THE QUARRY AT BELLIGNIES (NORD). (Depoussierage en carrieres. La carrière de Bellignies (Nord). Text in French. Equipement Mecan., 54(142:35-39, Oct. 1975.

Four dust control methods water spray, air stream, removal by heaps, and source by source removal were studied. The last was considered most effective for the Bellignies quarry. Each source of dust is covered according to the extent to which the source can be enclosed, the necessary aperture, and the entry speed. The rate of aspiration is critical because it controls the cost and the efficacy of the dust removal process; each cover is equipped with an aspiration cone which allows for adaptation to the corresponding cover aspiration, an aspiration speed limited to the collection of the dust particles, and minimum loss of particles. A tube filter dust remover is used because the dry recovery of dusts is advantageous, and the quantity of dust ejected into the atmosphere after passage through the separator must not exceed 150 mg/cu m. In this type of filter, filtration takes place outside the filtering layer (the tubes), and the clean air is passed into the tubes.

58735

APTIC NO. 82739

Lee, R. K. and J. E. Thoss

EXHAUST TRAIN SKIN TEMPERATURES FOR VEHICLES EQUIPPED WITH AND WITHOUT CATALYTIC CONVERTERS. Preprint, Universal Oil Products Co., Automotive Products Div., 70p., June 1975. 12 refs.

The extent to which catalytic converters increase the fire hazard of automobiles is investigated. Catalyst-equipped vehicles do not appear to increase the fire hazard posed by automobiles operating under normal conditions. Exhaust train skin temperatures for catalyst-equipped vehicles are similar to or lower than those observed for equivalent vehicles without catalytic converters when secondary air is added and the vehicles are operating normally as well as for light duty vehicles produced in the early and middle sixties. However, for vehicles operating at a continuous 25% misfire condition, the maximum exhaust train skin temperatures measured for vehicles with catalytic converters are significantly higher than equivalent cases without catalytic converters. Maximum exhaust train skin temperatures are observed downstream of the converter and are generally around 650 F. Exhaust train skin temperature maxima for vehicles with or without catalytic converters are sufficient to ignite kerosene, JP4 jet fuel, and gasoline vapors when the vehicle is operating normally. (Author conclusions modified)

58736

APTIC NO. 82117

Lee, Seth, Jr.

COMBINED ENGINE EXHAUST AND FUEL GASIFICATION SYSTEM FOR AN INTERNAL COMBUSTION ENGINE. (Assignee not given.) U. S. Pat. 3,911,881. 6p., Oct. 14, 1975. 15 refs. (Appl. Aug. 31, 1973, 12 claims).

A system for gasifying a mixture of fuel vapor and air for induction into an internal combustion engine is described. A chamber for gasifying fuel vapor in an air and fuel mixture is heated by contact with a baffled chamber for exhaust from an engine. A unique arrangement of baffles in the baffled chamber ensures temperature in the gasifying chamber adequate for gasifying the fuel vapor. Provisions for exhaust feedback to the gasifying chamber, air injection into the exhaust flow and auxiliary burning in the exhaust header ensure low pollution operation substantially in keeping with 1975 Federal standards. (Author summary modified)

Lefebvre, Arthur H., Harold L. Stocker, Samuel B. Reider, and Jerry G. Tomlinson

COMBUSTION APPARATUS AIR SUPPLY. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,877,221. 5p., April 15, 1975. 3 refs. (Appl. Aug. 27, 1973, 3 claims).

An inlet diffuser structure adapted to divide the air flowing to the combustion apparatus of a gas turbine engine between several flow paths is described. The structure is placed ahead of the combustion zone to divide the air between a portion flowing to the forward wall of the liner, a portion flowing the radially outer wall, and a portion flowing to the radially inner wall. A slot in the wall of the diffuser transfers air from compressor mid-radius to the passage leading to the liner inner wall. (Author abstract modified)

Leininger, Dieter and Ferenc Paul Monostory

COAL DESULFURIZATION BY PROCESS ENGINEERING MEASURES. (Kohlenentschwefelung durch aufbereitungstechnische Massnahmen). Text in German. Glueckauf (Essen), 111(22):1079-1082, Nov. 1975.

Coal desulfurization for reducing sulfur dioxide emissions from power stations, lowering the costs of ecological protection from the iron and steel industries, and utilizing coal deposits with a high sulfur content are described. Sulfur organically bound to coal is about 40% of the total in fine crude coal; the remaining 60% is concentrated in pyrite in grain formations above 0.04 mm. Depending on the properties of the raw material and equipment used, 10-80% of pyrite sulfur can be separated. The raw material and its products were divided into grain sizes 0.06-10 mm and densities of 1.5 and 2 kg/0.1 cu m. Analytical results revealed the efficiency limits of different desulfurization facilities and their desulfurization rates. Among the machines employed in the study (fine-grain settlers, floatators, hydrocyclones, shaking tables, graders, electrodynamic and magnetic separators) the settlers achieved the best results, depending on the raw material, with 50% of the pyrite in the feed separated into the tailings and an output of 90% in the concentrate. It was followed by the flotation process with 40-50% and 80%, respectively. The remaining separation methods yielded very good results depending on the raw material. No long-term operational results for the latter processes are presently available. All data developed was used to form the basis for planning, construction, and operation of a semi-technical, partly industrial experimental installation for desulfurization at coal-powered electric stations.

Lenz, H. P.

INFLUENCE OF MIXING SYSTEMS ON EXHAUST GAS DECONTAMINATION. (Einfluss der Gemischungsanlagen auf die Abgas-Entgiftung). Text in German. Preprint, Institut fuer Verbrennungskraftmaschinen und Kraftfahrwesen, Technische Akademie Wuppertal (West Germany), 29p., 1975. 10 refs. (Presented at the Automobile Exhaust Gas Decontamination Seminar, Wuppertal, Federal Republic of Germany, Feb. 3, 1975.)

Recent advances in carburetion methods for internal combustion engines and the effects of rich and lean fuel-air mixtures on exhaust gas compositions are reviewed. These new advances include Daimler Benz s type 4Al carburetor, a two stage carburetor with an equal pressure secondary stage, and injection pumps such as the Bendix Co. L- and K-Jetronic pumps. There is no optimal fuel-air ratio for all load conditions, nor for all exhaust emission requirements. At a low fuel-air ratio, carbon monoxide and polycyclic aromatic hydrocarbon concentrations are low in exhaust gases, but nitrogen oxides are high. A rich mixture is needed while the engine is warming. During this period carbon monoxide and hydrocarbon concentrations in exhaust gases may be 3 to 5 times greater than normal, while polycyclic aromatic hydrocarbons

may be present in greater quantity than normal by a factor of 20.

Lepeytre, Jean-Michel, Claude Paul, Louis Grandet, and Louis Minjolle

CATALYST FOR CLEANING ENGINE EXHAUST GASES. (Azote et Produits Chimiques, S.A., Toulouse and Ceraver, Paris (France)) U. S. Pat. 3,881,696. 7p., May 6, 1975. 7 refs. (Appl. Feb. 23, 1973, 11 claims).

A catalyst and process for catalytically cleaning exhaust gases from internal combustion engines are described. Hydrocarbons and carbon monoxide are converted to carbon dioxide while simultaneously nitrogen oxides are converted to nitrogen. The catalyst contains a ceramic carrier such as alumina combined with manganese oxide and/or chromium oxide and impregnated thereon a mixture of platinum and a metal oxide such as nickel, cobalt, or iron oxides. An aluminum salt is preferably impregnated into the ceramic carrier, and then calcined to form an aluminum oxide layer. This step is conducted prior to the introduction of platinum. No other catalysts have the strength and efficiency of this catalyst. (Author abstract modified)

Lerner, Bernard J.

METHOD FOR TREATING A GAS. (Assignee not given.) U. S. Pat. 3,895,926. 7p., July 22, 1975. 9 refs. (Appl. April 9, 1974, 10 claims).

A vortex type spray scrubber for gas cleaning is described which offers increased spray/gas contact at a relatively low energy level. The gas is introduced into a vessel and is caused to form at least one toroidal vortex. Preformed liquid droplets are introduced into the vortex, and the gas is treated by the liquid within the vortex. The gas is then separated from the liquid and withdrawn from the vessel. The vessel consists of an open top portion and a bottom wall with a gas inlet. A baffle plate is positioned within the vessel above the inlet opening and in spaced relation to the inlet opening to form a clearance gap therebetween. The baffle plate dimensions are less than the internal dimensions of the vessel, and a peripheral gap is thus formed between the baffle plate and the vessel wall. Spray nozzles are positioned above the baffle plate and are arranged to introduce liquid in droplet form into the gas vortex formed above the baffle plate. (Author summary modified)

Lientz, La Clede

FLARE STACK BURNER FOR ODOR AND POLLUTANT ELIMINATION. (Assignee not given.) U. S. Pat. 3,893,810. 9p., July 8, 1975. 16 refs. (Appl. Dec. 18, 1972, 9 claims).

A flare stack burner and method for burning pollutants such as noxious gases, particulate materials, and smoke carried by an air stream, to eliminate odor and pollution problems is described. The air stream is directed around orifices that inject a combustible material into the air stream for ignition and primary burning and by vanes for more complete combustion. The burning gases flow in a vertical path. The fuel is ignited downstream from the vanes to incinerate the pollutants in the air stream and a secondary air blast may be introduced into the burning stream for complete oxidation. (Author abstract modified)

Liesegang, Lutz

GAS WASHING AND CLEANING DEVICE. (Assignee not given.) U. S. Pat. 3,876,398. 5p., April 8, 1975. 11 refs. (Appl. Jan. 22, 1974, 3 claims).

A wet washing and cleaning device for gases is described which has a vessel partially filled with washing liquid and a

CONTROL METHODS

means for charging the vessel with dust containing gas. The performance and throughput is determined by the energy expended for washing. The washing intensity of the known equipment is not adjustable independently from throughput. The specific improvement consists of a conical stopper which can be lifted and lowered in relation to the lower end of the tube. The distance of the lower tube end from the liquid level is adjustable. The conical stopper establishes an annular gap between the stopper itself and the tube end, and this gap is adjustable through lifting and lowering of the stopper. (Author summary modified)

58744

APTIC NO. 76517

Lin, Ping-Wah

WASTEWATER TREATMENT WITH AN SO₂-REMOVAL BY-PRODUCT. *J. Water Pollution Control Federation*, 47(9):2271-2280, Sept. 1975. 14 refs.

The use of sulfur dioxide removal by-product in wastewater treatment is discussed. Combustion gases from fuel burning furnaces are treated in order to separate solid particles as fly ash and to oxidize the SO₂ gas contained therein into sulfur trioxide. The SO₃ is reacted with lime to form a coating of calcium sulfate over the external surfaces of calcium oxide particles. The particles are then quenched rapidly from reactor temperature to ambient or below ambient temperature, and many cracks result in the lamination of calcium sulfate. The by-product is suitable for wastewater treatment by acid neutralization and phosphate and turbidity removal, for flooring plaster, and for use as a binder for fly ash to produce construction materials. The potential production depends on the application of the sulfur oxides removal process for air pollution control by the industries burning fuels containing sulfur.

58745

APTIC NO. 82676

Lipscomb, Virgil J.

PVC VALVE FILTER. (Assignee not given.) U. S. Pat. 3,877,451. 5p., April 15, 1975. 4 refs. (Appl. Dec. 28, 1975, 1 claim).

A positive crankcase ventilation (PCV) valve filter for an internal combustion engine is described that includes a means for mounting the filter between the engine crankcase and a PCV valve. The filter consists of a housing and cover as well as a cartridge that can be removed and replaced when desired. (Author abstract modified)

58746

APTIC NO. 76439

Lisauskas, Robert A. and Stephen A. Johnson

NO_x FORMATION DURING THE COMBUSTION OF LOW AND INTERMEDIATE BTU GAS FROM COAL. Preprint, American Inst. of Chemical Engineers, New York, 43p., 1975. 12 refs. (Presented at the American Institute of Chemical Engineers National Meeting, 80th, Boston, Mass., Sept. 8, 1975.)

Low and intermediate Btu gas from a pilot fixed-bed coal gasifier was burned in a refractory line test furnace using a scaled register-type burner to study the resultant nitrogen oxide formation. Increased NO_x formation was observed as a function of heat input, fuel gas ammonia content, and flue gas oxygen concentration. The maximum measured NO_x concentration was 315 ppm. Nitrogen oxide emissions from intermediate Btu gas were lower than from low Btu gas at a constant heat input to the furnace, even though the ammonia content of the intermediate Btu gas was about double that of the low Btu gas. This was due to the fact that the flow rate of the intermediate Btu gas was half that of the low Btu gas and that the increase in the mole ratio of flue gas to fuel gas was smaller than the corresponding rise in gas heating value. At low ammonia concentrations (0-2000 ppm), the conversion of NH₃ to NO_x in a laboratory pre-mixed flame was approximately twice that which was observed in a diffusion flame. (Author abstract modified)

58747

APTIC NO. 82023

List, Hans and Karl Kirchweger

INTERNAL COMBUSTION ENGINE WITH INTERNAL MIXTURE FORMATION. (Hans List, Graz (Austria)) U. S. Pat. 3,903,849. 20p., Sept. 9, 1975. 8 refs. (Appl. May 10, 1973, 3 claims).

A diesel engine design with internal mixture formation for the reduction of nitrogen oxide emissions is described. Each cylinder is provided with two intake valves, and a partial air current is produced at least at one of the intake valves so that the direction of this current in the cylinder is in opposition to the sense of rotation of the combustion air entering the cylinder through the remaining intake valve cross sections. Flow conditions are thus produced under which turbulence is established in the cylinder proper by the collision between the branch air currents rotating about the cylinder axis in opposite directions.

58748

APTIC NO. 82933

Llewellyn, Richard Penderell and John Austin Hart

PARTICLE SEPARATOR. (State Electricity Commission of Victoria, Melbourne (Australia)) U. S. Pat. 3,883,332. 12p., May 13, 1975. 10 refs. (Appl. Dec. 11, 1972, 3 claims).

An apparatus for separating particles from a stream of gas and entrained particles is described. It consists of an annular duct with an inlet at one end to direct the stream into the duct with a swirl, and an outlet at the other end to divide the inner part of the flow from particles in the outer region of the flow. The inlet and duct are shaped so that the swirl within the duct is that of a potential vortex in which the velocity is perpendicular to the axis of the vortex and is inversely proportional to the radius from this axis. This enables substantially streamline flow to be maintained. The annular duct may be conically tapered. Conventionally, the required partial segregation for separation firing is obtained in a tubular concentrator fitted with radial vanes which superimpose a swirling motion on the flow. Such a concentrator creates large pressure losses in the system and substantial extra power is required to overcome these losses. (Author abstract modified)

58749

APTIC NO. 76135

Locklin, David W. and Richard E. Barrett

GUIDELINES FOR RESIDENTIAL OIL-BURNER ADJUSTMENTS. Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract 68-02-0251, Program Element 1AB014, ROAP 21ADG-AM, Rept. EPA-600/2-75-069-a, 25p., Oct. 1975. 14 refs.

Guidelines for adjusting residential oil burners to minimize air pollutant emissions and maximize fuel use are presented. The guidelines are intended for use by skilled service technicians in adjusting burners and as an aid to service managers engaged in training service technicians. Pollutants affected by the adjustments include: particulates, nitrogen oxides, hydrocarbons, and carbon monoxide. Background information on these pollutants and the emission characteristics of residential oil burners as well on the significance of pollutant measurements is presented in appendices. (Author abstract modified)

58750

APTIC NO. 82681

Long, Raymond H. and Morgan C. Sze

DESULFURIZING COKE WITH PHOSGENE OR A MIXTURE OF CARBON MONOXIDE AND CHLORINE. (Assignee not given.) U. S. Pat. 3,878,051. 6p., April 15, 1975. 5 refs. (Appl. Aug. 31, 1973, 17 claims).

A new improved process for producing a coke having a sulfur content of less than 0.85% is described. Coke is desulfurized by contact with phosgene gas or a mixture of carbon monoxide and chlorine, at a temperature from 1200-1800 C, to produce coke having an S content no greater than 0.85%. The coke may be admixed with a ferruginous material and/or ferric

sulfate or sulfuric acid as a desulfurizing promoter. Other processes are not effective for producing a desulfurized coke from a wide variety of feedstocks having various S contents, including S contents of 4% and greater, which meet standards of an S content of less than 0.85% and preferably less than 0.5%. (Author abstract modified)

58751

APTIC NO. 76324

Lowe, T. M., M. P. Heap, and B. R. Smith

CONTROL OF POLLUTANT EMISSION BY BURNER MODIFICATIONS. *Riv. Combust.*, 29(5-6):197-216, May-June 1975. 24 refs. (Presented at the Italian Flame Days, Sanremo, April 10-11, 1975, Paper K20/a/76.)

Burner design optimization is discussed as a method of achieving efficient combustion and low pollutant emission. The pollutants considered are nitric oxide, noise, hydrocarbons, and/or particulates, with respect to natural gas, fuel oil, and pulverized coal flames. The effect of burner parameters on the formation of NO in flames is due to variations in the mixing pattern of the fuel, the combustion air, and the recirculating combustion products. Control of NO emission via burner parameters applies for a range of process temperatures, preheats, loads, and heat extraction rates. The spacing of multiple burner systems does not normally modify the NO emission. Dual fuel firing has the tendency to increase NO emission.

58752

APTIC NO. 72841

Luchter, S. and W. Mirsky

A SURVEY OF AUTOMOTIVE RANKINE CYCLE COMBUSTION TECHNOLOGY. *Preprint, Society of Automotive Engineers, Warrendale, Pa.*, 13p., 1975. 27 refs. (Presented at the Society of Automotive Engineers Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750067.)

Technology on the design of Rankine cycle combustors for automotive application is surveyed. The Rankine cycle engine is an alternative to the emission controlled spark ignition automotive engine primarily because of the promise of inherently low emissions. Experimental automotive Rankine combustors were built and tested ranging from small scale bench test devices to integrated vapor generators installed and operating in vehicles. Three combustors were successfully developed as part of the Environmental Protection Agency Alternative Automotive Power Systems engine development program. Other combustors were developed as part of a combustor technology effort by EPA and other groups developed combustors as part of vehicle programs. Each of these devices is described in summary form: TECO system, SES combustor, Aerojet Liquid Rocket Co. system, SOS combustor, solar combustor, General Motors system, and the Williams and Carter system. The steady state emissions from several of the combustors were compared by plotting available data as specific emission (gm/kg) as a function of overall fuel-air ratio.

58753

APTIC NO. 83749

Lyon, Richard S. and Ralph L. Lyon

METHOD AND APPARATUS FOR CLEANING EXHAUST GAS. (United McGill Corp., Columbus, Ohio) U. S. Pat. 3,885,929. 13p., May 27, 1975. 8 refs. (Appl. Oct. 26, 1973, 51 claims).

A system for cleaning air polluted with metallic chlorides and hydrogen chloride gas is described. The air is heated to convert the metallic chlorides to metallic oxides and HCl gas and then conveyed to a gas scrubber. Before entering the scrubber, fresh water is sprayed into the air to rapidly cool it. The water reacts with the HCl gas to form HCl acid. The scrubber uses water to wash and scrub the air and remove the pollutants from the air. (Author abstract modified)

58754

APTIC NO. 81740

MacDonald, James E. and Oliver K. Painter

SMOKELESS NON-RECOVERY TYPE COKE OVEN. (Assignee not given.) U. S. Pat. 3,912,597. 7p., Oct. 14, 1975. 4 refs. (Appl. March 8, 1974, 10 claims).

Ignition chambers are used in a non-recovery type coke oven for the complete and smokeless combustion of distillation products produced during the coking process. Passageways in the walls of the coke oven conduct the partially burned distillation products from the space above the coal charge to the sole heating flues located under the oven floor. The partially burned distillation products are drawn from the heating flues and undergo complete combustion as they pass upward through an ignition chamber and then downward through a second ignition chamber. A stack with a variable speed fan is used to control the draw on the coke oven and the exhaust to the atmosphere of the combustion product received from the ignition chambers. (Author abstract modified)

58755

APTIC NO. 76531

Mack, W. A.

VCM REDUCTION AND CONTROL. *Chem. Eng. Progr.*, 71(9):41-44, Sept. 1975.

The reduction and control of vinyl chloride monomer (VCM) in polyvinyl chloride (PVC) process operations are discussed. The Occupational Safety and Health Administration (OSHA) regulations limit the atmospheric levels of the monomer in working areas to 0.5 ppm. During the dry blending of PVC homopolymers and copolymers, VCM levels in the finished dry blends as well as in the atmosphere of the mixing area can be reduced without significant engineering alterations to the plants, and with only minor modifications to the existing mixing process. Aspiration and air stripping during dry blending is an effective method of removing VCM. The monomer generated during the mixing process is removed from the working area and the VCM content in the compounded formula can be reduced to a final level of 5-10 ppm. The exhaust from the aspirator is vented through a duct away from the working area. It is eventually exhausted to the atmosphere, which may cause other potential problems in the future.

58756

APTIC NO. 83646

Maeda, Isamu and Nobuo Ito

PRODUCTION OF SULFURIC ACID FROM DISCHARGED GASES. (Haigasuru kara ryusan o seiso suru hoho). Text in Japanese. (Sumitomo Shipbuilding and Machinery Co., Ltd. (Japan)) Japan. Pat. Sho 50-12400. 5p., May 12, 1975. 1 ref. (Appl. May 30, 1968, 1 claim).

Discharged gases containing sulfur dioxide at low concentrations are first absorbed in an absorber. The absorbed SO₂ is desorbed by heating with a gas which was warmed by the heat of conversion of SO₂ to sulfur trioxide. The SO₂ thus desorbed is used as a raw material for the production of sulfuric acid. Activated carbon may be used as an adsorber. For the desorption or regeneration of the adsorber, inert gas free from oxygen is usually applied. This gas is heated to a temperature suitable for desorption in a heat exchanger. For heating the heat exchanger, the heat evolved by the conversion of SO₂ to SO₃ is used. Adsorption by activated carbon is followed by desorption; very dilute SO₂ in the gases discharged from a boiler becomes highly concentrated. This SO₂-rich gas is then cleaned and dried. Clean air is mixed with the dried gas. This air-gas mixture is then led into a 1st conversion tower, where SO₂ is oxidized to SO₃. Further conversion takes place in a 2nd conversion tower, where SO₃ is recovered as 98% H₂SO₄. A small amount of SO₂ escapes without oxidation. Therefore, the gas coming out of the 2nd conversion tower is preferably sent to the inlet of the apparatus where raw gas enters.

CONTROL METHODS

58762

58757

APTIC NO. 79995

Maeda, Y., H. Iijima, and R. Takashima

REMOVAL OF PLASTICIZER MIST BY MTC MIST SEPARATOR. (MTC misuto separata ni yoru kasoza misto jokyō). Text in Japanese. Enbi to Porima (Polyvinyl Chloride Polym.), 15(8):24, Aug. 1975.

A separator for plasticizer mist, developed by the Mitsui-Toatsu Chemical Co., is described. The separator contains a cylindrical shaped glass fiber filter (25 cm in diameter and 51 cm high), which is enclosed within a cylindrical casing. The gas enters the separator and passes through a filter and the mist in the gas condenses on the filter. The condensed liquid moves to the inner side of filter with the stream of gas and is drained out from the bottom of the separator, while the cleaned gas emerges from the top of the separator. The mist separator is to be used with a preliminary filtering apparatus for the removal of dust in the waste gas. For example, the treatment of waste gas from a vinyl chloride process involves first cooling the gas, then a preliminary filtering before the gas is finally taken into the mist separator. The mist concentrations in one trial were 380 mg/N cu m at the entrance to the cooling apparatus, 368 mg/N cu m at the entrance to the preliminary filtering apparatus, 348 mg/N cu m at the entrance to the mist separator, and 17.4 mg/N cu m for the gas treated by the mist separator. Mist sizes larger than 3 micron can be completely removed from the waste gas by the mist separator.

58758

APTIC NO. 82009

Maekawa, Takehiko, Masahiko Nakada, and Hirofumi Matsumoto

INTAKE MANIFOLD. (Toyota Jidosha Kogyo Kabushiki Kaisha (Japan)) U. S. Pat. 3,908,620. 4p., Sept. 30, 1975. 9 refs. (Appl. June 21, 1973, 1 claim).

An intake manifold for an internal combustion engine utilizing a carburetor having dual passages includes a manifold housing which also has dual passages in communication with the carburetor dual passages. One of the passages in the manifold housing is heated in a positive manner to facilitate vaporization of fuel in the heated manifold passage, thereby improving operability of the engine during warmup and also reducing the noxious components, such as carbon monoxide and hydrocarbons, in the exhaust gas. (Author abstract)

58759

APTIC NO. 82453

Maelzig, G.

UTILIZATION OF CLINKER COOLING EXHAUST AIR AT THE GEISINGEN CEMENT PLANT. (Verwendung der Klinkerkuehlerluft im Zementwerk Geisingen). Text in German. Zement-Kalk-Gips (Wiesbaden), 28(9):384-385, 1975. 4 refs.

A system adopted at the Geisingen cement works of Breisgauer Portland-Cementfabrik, West Germany, for dust separation and for the utilization of the waste heat in the clinker cooling exhaust air is described. The air is exhausted from the clinker cooler at two points, with both ducts being equipped with multicyclones to reduce the dust concentration to below 300 mg/cu m, after which the exhaust flow with the higher temperature passes through a heat exchanger for heat recovery. Then, the two partial flows are united and ultimately combined with the Lepol furnace flue gases which has a dust concentration of 1.6-1.8 g/cu m and a temperature of 95 C. As a result of mixing the exhaust air with the kiln flue gases, a waste gas with 125 C temperature and with a dew point decreased from 58 C to 51 C is obtained, which provides optimal conditions for the subsequent dust separation in an electrostatic precipitator without corrosion hazards on the electrode due to temperature drops to below the dew point. As a result, it is possible to use standard steel electrodes in the precipitator. The precipitator used in this system has been working satisfactorily without any corrosion for 4 years. This system has been adopted successfully at several other plants.

58760

APTIC NO. 76091

Magee, E. M.

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES. COAL TREATMENT: SECTION 1. MEYERS PROCESS (FINAL REPORT). Exxon Research and Engineering Co., Linden, N. J., Environmental Protection Agency Contract 68-02-0629, Program Element 1AB013, ROAP 21ADD-023, Rept. EPA-650/2-74-009-k, EXXON/GRU.10DJ.75, 46p., Sept. 1975. 12 refs.

NTIS: PB 246311/AS

A review of the Meyers process for removing pyritic sulfur from coal is presented, with particular emphasis on the environmental impact of the process. The pyrites in the coal are removed by reaction with ferric sulfate in a solution containing ferric and ferrous sulfates and sulfuric acid. The ferric ion is continuously regenerated by the reaction of oxygen and ferrous ion. The iron product from the pyrites is removed as solid ferric and ferrous sulfates. The coal is not converted in the process and essentially retains its original heating value. Except for minor vents, there are no air effluents from the process. Dust control is necessary if the product sulfur is stored and handled as a solid. The burning of product coal in an auxiliary steam plant is expected to produce stack gas emissions of nitrogen oxides, carbon monoxide, and sulfur oxides which must be controlled. The sulfur in the product coal produces 1.49 lb of SO₂/million Btu; this is higher than the present Federal limit of 1.2 lb SO₂/million Btu for large power plants.

58761

APTIC NO. 83382

Mai, Gerhard and Reiner Siepmann

METHOD FOR PREPARING A CATALYST FOR THE OXIDATIVE PURIFICATION OF EXHAUST GASES. (W. C. Heraeus GmbH, Hanau am Main (Federal Republic of Germany)) U. S. Pat. 3,893,950. 5p., July 8, 1975. 7 refs. (Appl. Nov. 23, 1973, 4 claims).

A method for preparing a catalyst for the oxidative purification of exhaust gases of internal combustion engines is described. The catalysts are prepared by applying a suspension whose solid content consists essentially of boehmite to a ceramic support body thereby forming an intermediate coating which is adapted to receive one or more fine divided metals of the platinum group or its alloys. The treated support body is heated. The coating suspension also can contain dissolved aluminum nitrate. The intermediate coating of boehmite on the support body is converted to active aluminum oxide prior to impregnation with one or more metals of the Pt group or its alloys. The conversion takes place after such impregnation by heating upon exposure to the hot exhaust gases of the engine. Unlike other catalysts, the activity of this catalyst is substantially independent of its age. (Author abstract modified)

58762

APTIC NO. 83628

Maier, Siegfried

MEANS OF CONTROL OF EXHAUST GAS TURBOCHARGERS. (Mittel der Regelung von Abgasturbohaladern). Text in German. Preprint, Technische Akademie Wuppertal (Federal Republic of Germany), 8p., 1975. (Presented at the Automobile Exhaust Gas Decontamination Seminar Wuppertal, Federal Republic of Germany, Feb. 3-4, 1975.)

Possible design modifications and means for controlling exhaust gas turbochargers in spark-ignition and diesel engines in automobiles are described. Exhaust turbochargers increase the mean pressure and improve the fuel economy, but they cause an air deficit in the lower engine speed range, which results in a sharp drop in torque and in smoking. Different solutions proposed to eliminate the disadvantages of exhaust turbochargers to improve acceleration and flexibility, and to reduce the flywheel mass are discussed.

VOLATILE VAPOR RECOVERY SYSTEM AND METHOD UTILIZING JOULE THOMPSON EXPANSION. (General American Transportation Corp., Chicago, Ill.) U. S. Pat. 3,903,708. 6p., Sept. 9, 1975. 7 refs. (Appl. May 7, 1973, 9 claims).

A system for recovering hydrocarbon vapors during bulk gasoline loading is described which discharges heat directly to the atmosphere without the use of refrigeration and returns the recovered liquid product to storage at ambient temperature. The system includes a saturating vessel for rendering the vapor stream non-explosive, several high-pressure ambient air-cooled condensing stages, and an expansion vessel for receiving the vapors from the last condensing stage. Each condensing stage compresses the vapor stream and then cools it to ambient temperature without the use of refrigeration. The vapors are further cooled and condensed by Joule Thompson expansion. Means are also provided for returning recovered liquid from the condensing stages and the expansion vessel to the saturating vessel as well as for venting the residual vapors from the expansion vessel. Compressor coolant can be cycled through one of the condensing stages.

FUEL INJECTOR ASSEMBLY. (Assignee not given.) U. S. Pat. 3,898,970. 8p., Aug. 12, 1975. 7 refs. (Appl. May 24, 1973, 2 claims).

A fuel injector assembly for injecting fuel into the combustion chambers of high speed internal combustion engines is described. It contains a main cylinder mounted upon the engine block and a main piston slidable within the main cylinder. The piston has an outer piston face which is exposed to the conditions prevailing in the engine cylinder and an inner piston face. A pump plunger is secured to the inner piston face and coacts with a pump chamber to pump liquid fuel into the engine cylinder during upward movement of the main piston into the main cylinder, caused by the progressively increasing pressure developed in the engine cylinder during the compression stroke of the engine piston. Liquid fuel is admitted into the interior of the main cylinder behind the main piston so that the increase in pressure developed in the engine cylinder acts through the main piston to accordingly pressurize the liquid fuel within the main cylinder. A pressure responsive modulator valve modulates the exhausting of fuel from the main cylinder in dependence upon the fuel pressure within the main cylinder to thereby control the rate and extent of movement of the main piston to accordingly control the timing and amount of fuel injected into the engine cylinder. (Author abstract modified)

SYSTEM ANALYSIS OF DESULFURIZATION METHODS. STUDY SPONSORED BY THE GERMAN FEDERAL MINISTRY FOR RESEARCH AND TECHNOLOGY. (Die Systemanalyse Entschwefelungsverfahren. Eine Studie im Auftrag des Bundesministeriums fuer Forschung und Technologie). Text in German. VGB Kraftwerkstechnik, 55(6):355-359, June 1975.

A reduction in sulfur emissions by furnaces is possible by direct or indirect fuel desulfurization before combustion or generation of flue gases. In desulfurization of bituminous coal, reductions achieved amount to 1.3 to 1.0% by weight using carbon hydration or gasification for structural modification. Because brown coal contains considerable amounts of iron sulfide and gypsum, desulfurization is more difficult during processing, and, in firing, 40-60% of the sulfur is bound in coal ash. Heavy heating oil is directly desulfurizable under extreme conditions, e.g., 400 C and 100 bar hydrogen pressure, feasible in large furnaces with charges of more than 2 billion

t/a. Dry and wet techniques are presented for desulfurizing flue gas with end products of elemental sulfur, slaked lime and calcium sulfate. Because of the higher number of utilization hours per year, fuels may be desulfurized at a less costly rate than flue gases.

AIR FILTER FOR GASEOUS POLLUTANTS. (Farr Co., El Segundo, Calif.) U. S. Pat. 3,912,472. 6p., Oct. 14, 1975. 8 refs. (Appl. Dec. 29, 1971, 3 claims).

An air tight activated carbon filter for gaseous pollutants which is simple to construct and easy to disassemble for refilling is described. The filter consists of several channels, some being filled with activated carbon and the remaining acting to direct the air flow from the filter. A sealing lid is provided to seal the carbon within the channels, and a U-shaped sealing member extends about the inner walls of the filter to prevent any air leakage around the sealed activated carbon. (Author abstract modified)

POWER AND HEAT COUPLING IN LARGE CITIES. (Kraft-Waerme-Kopplung in Grossstaedten). Text in German. Energie (Munich), 27(11): 279-284, 1975. 2 refs.

A combined heat and power generation system supplies 10% of the residences in the three large West German municipalities studied (Berlin, Hamburg, Munich). For the future there is a planned extension of the system, especially since consumers are demanding comfortable heating systems, which contribute to heat loss and environmental problems. Nuclear power stations can help to stabilize heating costs. Problems in site selection for combined heat and power plants are given. Without appropriate solutions, it will not be possible to double the number of such plants within the planned 10 years. Economically sound regional boundaries must be established for heating stations at intervals of 3-25 km according to site conditions and fuel costs. However, the use of such power complexes seems feasible right now only in heating systems larger than 100 MW.

METHOD OF THE REMOVAL OF CHEMICALLY ACTIVE COMPONENTS FROM DUST-LADEN GAS STREAMS. (Assignee not given.) U. S. Pat. 3,892,543. 6p., July 1, 1975. 5 refs. (Appl. Oct. 9, 1973, 3 claims).

A method for the removal of chemically active components from dust laden gas streams is described. Dust laden gas streams from furnace waste gases containing a chemically toxic component such as sulfur dioxide, are initially passed through a first pocket filter to remove particulate matter and then may be charged with an additive capable of binding the toxic components in the form of solid particles which are entrained by the prepurified gas stream to a second pocket filter. The particulate layer contains the additive and is periodically dislodged and reentrained by the gas stream onto the filter surface until the quantity of additive which is deposited on the second filter surface is between 100 and 1000 times the quantity/hour of the additive charged into the prepurified gas stream. Equilibrium is maintained between collected solids on the second filter surface as additive solids are carried onto the latter so that the quantity of the additive withdrawn/hr as collected from the filter is equal to the quantity/hr of the additive charged into the prepurified gas stream. The system overcomes the problems associated with conventional systems in which the additive becomes ineffective prematurely with a concomitant decrease in efficiency and increase in cost. (Author abstract modified)

CONTROL METHODS

58776

58769

APTIC NO. 79750

Markus, G. A.

ENVIRONMENTAL PROTECTION THROUGH THE RATIONALIZATION OF CHEMICAL PRODUCT PROCESSING TECHNOLOGY IN COKING PLANTS. (*Zashchita okrazhayushchey sredy na osnove ratsionalizatsii tekhnologii pererabotki khimicheskikh produktov koksohimicheskikh zavodov*). Text in Russian. *Gigiena i Sanit.*, no. 5:91-93, 1975.

Measures taken for water and air pollution prevention at a phenol plant processing chemical products obtained in the coking process at Dzerzhinsk, USSR, are described. The phenol- and hydrogen sulfide-containing waste gases discharged from vacuum equipment are led through an absorber in which these pollutants are absorbed in an alkaline solution at 95-96% efficiency. Alkaline solution and carbon dioxide are used for the absorption of phenols from waste gases generated during the decomposition of phenolates. This method has an efficiency of 90-95%. A solution of alkaline phenolates is used for the absorption of pure phenols from storage facilities.

58770

APTIC NO. 82682

Marshall, David M.

METHOD AND APPARATUS FOR REDUCING NITRIC IN COMBUSTION ENGINES. (*Babcock and Wilcox Co.*, New York) U. S. Pat. 3,880,570. 7p., April 29, 1975. 11 refs. (Appl. Sept. 4, 1973, 4 claims).

A method and apparatus for reducing nitric oxide in combustion furnaces is described. The formation of NO is inhibited by mixing substantially inert flue gas with the fuel and air and thus causing the flue gas to absorb some of the heat of combustion so as to reduce the maximum flame temperature within the combustion zone, thereby inhibiting the formation of NO. In other systems, the method of lowering the combustion temperature is not economical because of the higher static pressures required to gas fans to overcome the system resistances inherent in a fuel burning apparatus.

58771

APTIC NO. 82602

Martens, S. W. and E. E. Nelson

CURRENT STATUS OF VEHICLE EVAPORATIVE EMISSION CONTROL. Preprint, General Motors Technical Center, Automotive Emission Control, 30p., 1975. 14 refs. (Presented at the North American Motor Vehicle Emissions Control Conference, Annual, 4th, Anaheim, Calif., Nov. 5, 1975.)

The current status of methods for controlling evaporative hydrocarbon emissions from motor vehicles is reviewed. Data obtained with the SHED (Sealed Housing for Evaporative Determinations) technique show that contemporary control systems are capable of reducing evaporative emissions by more than 80%. However, if the SHED technique is to be used in place of the currently used trap technique, the present regulatory level of 2 g/test is unrealistic. Furthermore, improved technology is needed to achieve the 6 g/test standard now required by California for 1978. The addition of a direct vent line from the carburetor bowl to the canister with appropriate valving is expected to be necessary.

58772

APTIC NO. 83737

Martin, Frank T.

CARBURETOR IDLE CONTROL MEANS. (Assignee not given.) U. S. Pat. 3,896,194. 5p., July 22, 1975. 9 refs. (Appl. June 6, 1974, 7 claims).

An idle control screw for controlling the idle of carburetors of internal combustion engines is described. The idle mixture control screw introduces air into the fuel before the fuel is supplied to the throttle bore of the carburetor to premix the air and fuel. The idle screw extends substantially into the throttle bore so that the air fuel mixture is introduced into the throttle bore in spaced relation to the side wall of the

carburetor. The fuel is thoroughly atomized and the air and fuel are effectively intermixed with the result that the engine operates more efficiently and both fuel consumption and air pollution are reduced.

58773

APTIC NO. 82042

Masaki, Kenji

MISFIRING DETECTOR FOR INTERNAL COMBUSTION ENGINES. (*Nissan Motor Co., Ltd.*, Yokohama (Japan)) U. S. Pat. 3,908,366. 7p., Sept. 30, 1975. 7 refs. (Appl. June 15, 1973, 9 claims).

A detection system for electronically sensing a misfire occurring in an internal combustion engine and a protective system for preventing a catalytic or thermal afterburner from being destroyed by unburned exhaust gases resulting from misfire are described. The misfiring detector consists of gas current pulse generator an engine speed sensor, and an electronic computing means responsive to the gas current pulse signal and the engine speed pulse signal. An electric output signal represents the occurrence of the misfire when the ratio of the number of the gas current pulse signal to that of the engine speed pulse signal is less than a predetermined value. Protection of the thermal or catalytic converter is accomplished by shutting off the unburned gas and/or secondary air drawn into the exhaust gas purifying means when misfire occurs or by controlling the amount of secondary air. (Author abstract modified)

58774

APTIC NO. 82495

Masaki, Kenji and Shuya Nambu

EXHAUST GAS RECIRCULATION CONTROL DEVICE. (*Nissan Motor Co., Ltd.*, Yokohama (Japan)) U. S. Pat. 3,896,777. 7p., July 29, 1975. 6 refs. (Appl. Aug. 27, 1973, 1 claim).

An exhaust gas recirculation system for controlling nitrogen oxide emissions from internal combustion engines is described which uses the vacuum in the venturi of the carburetor as an additional parameter for varying the flow rate of recirculated exhaust gas in accordance with that of the intake air. The intake manifold vacuum is modulated with venturi vacuum to actuate the exhaust gas recirculation control valve in the system.

58775

APTIC NO. 84003

Masek, Vaclav

QUANTITATIVE AND QUALITATIVE CHANGES OF SOLID EMISSIONS FROM A METALLURGICAL PLANT. (*Quantitative und qualitative Aenderungen der festen Emissionen aus einem Huetttenunternehmen*). Text in German. *Gesundh. Ingr.*, 96(12):340-347, 1975. 4 refs.

Since 1961, technological measures have been regularly implemented in a large Czech metallurgical plant in order to achieve significant reductions in dust emissions, down to 13.3 wt% by 1973. Twenty-six stations in 6 production areas were set up for monthly quantitative and qualitative evaluations using the scanning electron microscope JSM-50A. Observed for the period 1961-1973 were reductions in silicon dioxide, calcium oxide, magnesium oxide, aluminum oxide, iron and manganese concentrations as well as an increase in losses on ignition.

58776

APTIC NO. 82839

Maselli, James M. and Gwan Kim

AUTO EXHAUST CATALYST. (*Grace (W. R.) and Co.*, New York) U. S. Pat. 3,883,444. 5p., May 13, 1975. 5 refs. (Appl. April 11, 1973, 7 claims).

A catalyst for the reduction of nitrogen oxides from automobile exhausts is described. The system consists of cobalt oxide and optionally additional oxides of nickel, promoted with palladium and supported on a suitable support material. (Author abstract modified)

58777

APTIC NO. 84085

Matsnev, V. V., S. R. Sadofev, A. A. Levoshchenko, and B. G. Loktev

RESULTS OF TESTS OF PILOT-PLANT APPARATUS FOR CAPTURE OF SOLID MAZOUT EMISSIONS BEFORE REGENERATIVE AIR PREHEATER. (*Resultaty ispytaniy opytno-promyshlennoy ustanovki dlya ulavlivaniya pered RVP tverdykh mazutnykh vybrosov*). Text in Russian. *Teploenergetika*, no. 10:64-67, 1975. 3 refs.

Experimental studies of a direct-flow cyclone with a diameter of 350 mm for capture of solid particles from smoke in the gas of a steam generator with mazout burning were carried out in a laboratory and under plant conditions. When a high-sulfur mazout (grade 100) was burned with low surplus air, the efficiency of dust separation was 75% at 400 C, gas removal was 20%. The particles removed from the steam generator contained mazout coke greater than 8 micrometer, and also particles of soot and ash smaller than 8 micrometer.

58778

APTIC NO. 83075

Matsubara, Takenori, Chuichi Tsurudo, and Tsuneo Sato

GAS TURBINE COMBUSTION APPARATUS. (*Gas tabinyo nenshoki*). Text in Japanese. (Mitsubishi Heavy Industries Ltd. (Japan)) *Japan. Model Util. Sho* 50-36086. 3p., Oct. 21, 1975. 2 refs. (Appl. July 27, 1971).

A process for a gas turbine combustor with a soot controlling design feature which maintains the flames in the combustor using two sets of swirl vanes fixed at a prescribed angle around the fuel injection valve. Conventional combustors of gas turbines with swirl vanes for circulating the air supply in the combustor increase the emission of soot and dust. The new process provides a combustor with two different types of swirl vanes installed at different angles around the fuel injection valve, which will assist in mixing and dispersing the air and fuel so that the minimum required flames can be maintained in the combustor with a minimum of soot and dust emission. In this manner, the two sets of two different swirl vanes provide two different circulations of air in the combustion cylinder. One air circulation pattern maintains the minimum required flame, and the other circulation pattern mixes air and fuel for better combustion and less soot and dust emission. The swirl pattern is controlled by the two different fixed angles of the vanes.

58779

APTIC NO. 80116

Matsumoto, H.

PRESENT SITUATION OF THE DEVELOPMENT OF THE CONTROLLING TECHNIQUES FOR NOX FROM STATIONARY SOURCE. (*Kotei hasseigen no NOx boshi gijutsu kaihatsu no genkyo ni tsuite*). Text in Japanese. *Kankyo Gijutsu (Environ. Conserv. Eng.)*, 4(9): 630-637, Sept. 1975.

Various combustion techniques were developed as counter-measures for nitrogen oxides emission from stationary sources such as boiler and heating furnaces. A combination of two-stage combustion and exhaust gas mixing combustion reduced the NOx concentration from 616 ppm to 190 ppm in the exhaust gas from a 375 MW boiler for a 69% reduction. A combination of low oxygen combustion and exhaust gas recirculation reduced 70% of the NOx from a boiler emitting 6000 N cu m/hr of exhaust gas. The combinations of low NOx burner and two-stage combustion, or two-stage combustion and exhaust gas recirculation, or low NOx burner and two-stage combustion and exhaust gas recirculation also significantly reduced the NOx concentration. Flue gas denitration by reduction or oxidation were carried out using various catalysts or reagents. The reagents used for the oxidation-hydrolysis process included magnesium hydroxide, sodium hydroxide, and ozone while that used for the direct oxidation method was potassium permanganate-potassium hydroxide. Chlorine dioxide and sodium sulfite were used for the oxidation-reduction method while ammonia and catalyst were used for the direct reduction

method. The flue gas denitration techniques produce little secondary pollution and various by-products are usually recovered.

58780

APTIC NO. 83091

Matsumoto, Zenji, Kiyoshi Adachi, Toyohisa Fujimoto, and Nobutaka Ninomiya

RECYCLING APPARATUS FOR ACTIVATED CARBON. (*Kasseitan saisei sochi*). Text in Japanese. (Takeda Chemical Industries Co., Ltd. (Japan)) *Japan. Pat. Sho* 50-27477. 5p., Sept. 8, 1975. (Appl. Jan. 16, 1973, 1 claim).

An effective carbon regenerating device useful for both the direct and indirect heating methods is described. The main features of this device consists of a vertical furnace with a burner, a reaction gas supply system and an exhaust pipe with a damper, a vertical reaction cylinder with an inlet on top and an outlet at the bottom installed in the center of the furnace, a closed bottom vertical tube with an exhaust pipe with a damper and a reaction gas supply system installed in the center of the vertical reaction cylinder. The design characteristics of this device are multiple staged inter-meshing inclined ring plates on the inner wall of the vertical reaction cylinder and the outer wall of the vertical tube, and numerous air holes installed on the walls of the reaction cylinder and the vertical tube. The ring plates allow the activated carbon to descend smoothly by gravity. An actual example of regenerating activated carbon by this device with a 32-10 mesh pulverized activated carbon used for the tertiary treatment of industrial waste water shows that it can treat and regenerate 99% of activated carbons with almost the same chemical oxygen demanding substance and iodine adsorption capability as new activated carbon.

58781

APTIC NO. 83357

Matsuo, Susumu

APPARATUS FOR SEPARATION OF AIR AND DUST. (*Assignee not given.*) *U. S. Pat.* 3,887,959. 6p., June 10, 1975. 7 refs. (Appl. May 14, 1974, 2 claims).

An apparatus for separating dust and other matter from air is described. The apparatus uses a vacuum source, a gravitational force, and the inertia of the dust and air currents only to separate and collect 98% of the whole amount of dust sucked in conjunction with air without requiring the use of a filter or other similar separating means. This is an improvement over the prior art which does use a filter. The device consists of a closed dust hopper having an air discharge hole in a wall, and an air and dust injection nozzle positioned within the air discharge hole. A tube is spaced from the flange of the hole to guide the injected current of air into the hopper. The floating dust particles present in the arc are discharged through the air discharge hole from the hopper and are made to fly into the injected current of air and returned to the hopper. Air alone is thus allowed to advance toward the vacuum source. This device is useful for large scale sweeping operations, such as road sweepers, in which filters would be quickly clogged.

58782

APTIC NO. 80171

Matsuo, T.

ENVIRONMENTAL POLLUTION CONTROL IN OUR COMPANY (HITACHI, LTD.). (*Wagasha no kogai taisaku (Hitachi seisakusho)*). Text in Japanese. *Chuko to Tanko (Cast. Forg. Steel)*, no. 267-8-17, Oct. 1975.

A SO-HP13 model electrostatic precipitator is used for dust collection at a Hitachi cast iron melting process. The electrostatic precipitator treats 16,000 N cu m/hr at an inlet gas flow speed of 1 m/sec. The dust concentration in the waste gas is reduced from 0.2 g/N cu m to 0.005 g/N cu m. Bag filters are used for dust removal at three electric furnaces at the Hitachi steel manufacturing plants. The capacities of the bag filters are 1200 cu m/min, 1550 cu m/min, and 900 cu m/min, respectively, and the rate of dust collection is more than 99.7%. The zinc oxide fumes from eleven melting furnaces for non-ferrous

metals are also treated by bag filters, each having a capacity of 500 cu m/min. The dust collection efficiency is 99% and the dust concentration in the released waste gas is 0.01 g/N cu m. A large quantity of brownish yellow fume is emitted at the gas cutting process. The fume is introduced to a chamber which is sealed by an air curtain. It is then led to a bag filter where all the dusts are removed.

58783

APTIC NO. 82740

Maugh, Roger E.

COMMENTS ON THE CHANGING RELATIONSHIP BETWEEN AUTOMOTIVE MAINTENANCE AND AIR QUALITY. Preprint, Ford Motor Co., Dearborn, Mich., Automotive Emissions Office, 29p., 1975. (Presented at the North American Motor Vehicle Emissions Control Conference, Annual, 4th, Anaheim, Calif., Nov. 5-7, 1975.)

The changing relationship between automotive maintenance and air quality is discussed in connection with inspection and maintenance programs. Maladjustments and malfunctions on catalyst equipped vehicles are more likely to be factors in increased emissions than is normal mileage, and many of these maladjustments and malfunctions may not be readily identified by an examination of tailpipe idle or road load hydrocarbon/carbon monoxide concentrations. Also, many critical maladjustments or malfunctions do not result in overt changes in vehicle operation that would lead the owner to have his vehicle serviced. Thus, inspection/maintenance programs should include a mechanism to detect such hidden problems as the 1975 and 1976 model year cars get older. Generally, malfunctions in the ignition system primarily affect hydrocarbon emissions, and carburetor or air pump problems affect carbon monoxide emissions. Loss of exhaust gas recirculation increases nitrogen oxide emissions.

58784

APTIC NO. 82008

McAdams, Paul F.

TURBO-SUPERCHARGER EXHAUST. (Clark Equipment Co., Buchanan, Mich.) U. S. Pat. 3,908,369. 4p., Sept. 30, 1975. 11 refs. (Appl. May 6, 1974, 5 claims).

A stress-free exhaust construction for a supercharger on an engine has an adjacent wall through which exhaust gases are discharged. A rigid conduit member is connected to and extends away from the supercharger. A second rigid conduit member in alignment with the first conduit extends through the wall. There are cooperating baffles at the adjacent ends of the two conduit members which provide a nonrigid connection between the two conduit members and a tortuous passage for gases between the inside and the outside of the connection. The invention decreases the amount of exhaust gases discharged through the connection instead of out through the end of the exhaust pipe. (Author abstract modified)

58785

APTIC NO. 82936

McCrea, Donald H. and John G. Myers

SIMULTANEOUSLY REMOVING SULFUR AND NITROGEN OXIDES FROM GASES. (Assignee not given.) U. S. Pat. 3,880,618. 5p., April 29, 1975. 6 refs. (Appl. March 2, 1973, 4 claims).

A process for simultaneously removing sulfur and nitrogen oxides from waste gases is described. Hot flue gas is cooled to 75-150 C and passed over alkalized alumina or alkali metal carbonate or oxide to simultaneously remove sulfur oxides and NOx. The absorbent is regenerated first by heating to 300-400 C to drive off nitric oxide, and then by heating to 600-700 C to drive off absorbed sulfur compounds. (Author abstract modified)

58786

APTIC NO. 80036

McDonald, P. I.

NEW POLICIES FOR CONTROL OF ENVIRONMENTAL POLLUTION IN CHINA. *Solid Wastes*, 65(11):543-545, Nov. 1975. 9 refs.

New policies for the control of environmental pollution in China are discussed. New industrial districts, about 20 km from cities and separated from them by a green belt, are constructed. Harmful chemicals are eliminated from some industrial processes such as (e.g., the cyanide in electroplating). A wide range of harmful wastes are recovered from industrial processes. Fertilizers and insecticides are made from waste products and exhaust gases. There is an attempt to eliminate air pollution inside factories, particularly in the electronic and defense industries where dirty air adversely affects the quality of the articles that are being manufactured.

58787

APTIC NO. 83350

McDougal, John A. and John W. Lenington

INTERNAL COMBUSTION ENGINE IGNITION SYSTEM AND CLEANING DEVICE. (Linayer Corp., Detroit, Mich.) U. S. Pat. 3,903,856. 17p., Sept. 9, 1975. 7 refs. (Appl. Feb. 28, 1973, 47 claims).

A system for cleaning the combustion chambers of internal combustion engines to reduce the combustion chamber deposits is described. Hydrocarbon emissions from the exhaust of automobile engines result from crevices in the combustion chamber where gasoline, liquid, and vapor find refuge from the burning process so that they are released to the atmosphere during the exhaust stroke as unburned hydrocarbons. In this system, the ignition timing of selected cylinders is electrically advanced beyond the ordinary operating advances. This advance results in especially high combustion chamber surface temperatures and high detonation pressures, which burn and dislodge the deposits so that they are removed from the combustion chamber on the exhaust stroke.

58788

APTIC NO. 75991

McKenna, John D., John C. Mycock, and William O. Lipscomb

APPLYING FABRIC FILTRATION TO COAL FIRED INDUSTRIAL BOILERS. A PILOT SCALE INVESTIGATION (FINAL REPORT). *Enviro-Systems and Research, Inc.*, Roanoke, Va., Environmental Protection Agency Contract 68-02-1093, Program Element 1AB012, ROAP 21ADM-033, Rept. EPA-650/2-74-058-a, 204p., Aug. 1975. 32 refs.

NTIS: PB 245186/AS

A pilot-scale investigation to determine the technical and economic feasibility of applying a fabric filter dust collecting to coal-fired industrial boilers was conducted. The pilot facility which was located on a slip stream of a 60,000 lb/hr boiler was capable of handling 11,000 acfm at an air-to-cloth ratio of 6:1. Nomex felt fabric material achieved the lowest outlet dust concentrations, while Teflon felt operated at the lowest pressure drop. All media tested achieved outlet loadings well within allowable limits. Higher collection efficiencies were achieved with Nomex felt by discontinuing reverse air cleaning. Varying the volume of reverse air from 1400 to 4000 acfm exerted little effect on removal efficiency. However, increasing the amount of air used for cleaning did reduce the pressure drop across the bags. Fabric filter dust collectors appear economically attractive when compared to electrostatic precipitators operating 95% efficiency or better, assuming that a 2-year bag life can be achieved. (Author abstract modified)

58789

APTIC NO. 82675

Meeks, Thomas

INTERNAL COMBUSTION ENGINE POLLUTION CONTROL APPARATUS. (Matt Perdue, Long Beach, Calif.) U. S. Pat. 3,877,450. 5p., April 15, 1975. 8 refs. (Appl. June 4, 1973, 8 claims).

A pollution control apparatus for an internal combustion engine is described. Oxygen is utilized to augment the normal air supply and thereby promote complete fuel combustion. Separate oxygen conduits are connected to each cylinder; flow through the conduits is controlled by solenoid operated valves

connected in parallel with the spark plug. The connections are such that the current impulse which fires the plug of one cylinder effects release of oxygen to another cylinder during its intake stroke. Introduction of O₂ downstream of the carburetor prevents the O₂ flow from affecting the fuel-air ratios. No other injection systems are capable of a precise metering of O₂ to the individual cylinders, sequentially and at the proper time for maximum benefit. (Author abstract modified)

58790

APTIC NO. 83305

Meissner, Peter

DETERMINATION OF THE PRESSURE LOSS IN GAS CYCLONES. (*Bestimmung des Druckverlustes in Gaszyklonen*). Text in German. Chem.-Ing.-Tech., 46(17):743, 1975. 5 refs. (The full-length text can be obtained from: Verlag Chemie GmbH, D-6940 Weinheim, Postfach 1260, West Germany).

Studies on the determination of the pressure loss in particulate-free isothermal and incompressible streams in gas cyclones are reviewed. The rigid-body vortex radius is shown graphically as a function of the ratio of the mean axial speed to the speed measured at the wall circumference, which ratio is proportional to the intensity of twist. The total pressure loss that is caused solely by the rotation of the gas asymptotically approaches a constant value, namely the energy loss factor with decreasing twist, i.e., with increasing ratio of the distance from the twist tube inlet to the twist tube diameter. The results are of practical importance for cyclones with a long straight clean gas pipe.

58791

APTIC NO. 82143

Melby, Raymond C.

SUPERCHARGED SIX-STROKE CYCLE COMBUSTION ENGINE. (Assignee not given.) U. S. Pat. Pat. 3,896,775. 6p., July 29, 1975. 10 refs. (Appl. Aug. 21, 1974, 8 claims).

A supercharged six-stroke cycle internal combustion engine that results in reduced exhaust emissions is described. The flow of gases into and out of each combustion chamber is controlled by two pairs of cam shaft actuated intake and exhaust valves. Fresh air is first inducted from a fresh air intake through a first intake valve and is then compressed and exhausted through a first exhaust valve into a carburetted second intake. Thus the downstream end of the carburetted intake from which air and fuel is inducted through the second intake valve is somewhat pressurized. The air and fuel mixture is then compressed and ignited in the combustion chamber and thereafter exhausted through the second exhaust valve. (Author abstract modified)

58792

APTIC NO. 82491

Melchior, Jean Frederic

SUPERCHARGED DIESEL ENGINES AND METHODS OF STARTING THEM. (Etat Francais, Paris (France)) U. S. Pat. 3,894,392. 6p., July 15, 1975. 6 refs. (Appl. April 26, 1974, 10 claims).

Methods of starting supercharged diesel engines with a low compression ratio are described. The diesel engine has a closed cooling system traversed by a liquid and a supercharging unit whose turbine is supplied by exhaust gases through a combustion chamber. The compressor supplies the engine through a cooler mounted in the cooling system and the combustion chamber. A by-pass pipe is arranged in parallel with the cooler, and, during the period of starting and rise in temperature of the engine, a part of the air delivered by the compressor passes through the by-pass pipe. (Author abstract modified)

58793

APTIC NO. 82033

Melin, Deering D., Jr.

METHOD FOR REMOVING SO₂ FROM GASES. (Krebs Engineers, Menlo Park, Calif.) U. S. Pat. 3,907,523. 5p., Sept. 23, 1975. 5 refs. (Appl. Aug. 21, 1974, 4 claims).

AIR POLLUTION ABSTRACTS, JUNE 1976

A lime scrubbing process for the removal of sulfur dioxide from waste gases is described which overcomes scaling problems associated with prior art devices. An alkali scrubbing medium, viz., milk of lime slurry, is separately supplied to each scrubbing stage of a multi-stage scrubber. The slurry is separately removed from each stage at a constant pH, preferably about 5.5-6.0, and is delivered into holding tanks where it is subjected to alkali conditioning to raise the pH level. The reconditioned slurry is then pumped back to the respective scrubbing stages.

58794

APTIC NO. 83212

Mercer, Joe F.

EXHAUST DEVICE FOR INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,875,743. 6p., April 8, 1975. 6 refs. (Appl. Aug. 10, 1973, 2 claims).

A device for cleaning exhaust gases of internal combustion engines is described. The washer employs water mixed with a detergent and a circulating pump, a cooling radiator, and a magnetic muffler. The device consists of a compartmented washer connected to the exhaust system of an engine, a system of check valves, a circulating pump, and a radiator for cooling the washing liquid. The gases from the washer are passed through a magnetic muffler prior to release to the atmosphere. (Author abstract modified)

58795

APTIC NO. 82047

Merritt, John H., Jr.

ECONOMIZER FOR STEAM BOILER. (Applied Engineering Co., Orangeburg, S. C.) U. S. Pat. 3,910,236. 5p., Oct. 7, 1975. 5 refs. (Appl. Oct. 10, 1974, 8 claims).

A method of transferring heat in the flue gases of a steam boiler to the feedwater to the boiler is described. A heat exchange economizer coil is positioned so the flue gases from the boiler pass around. The flow of the feedwater to the boiler is divided into a first flow path through the coil so that heat from the flue gases is transferred through the coil to the feedwater. In the second flow path, the gas by-passes the coil in response to the average temperature of the flue gases after passage around the coil. This maintains the flue gases within an average prescribed temperature range above the dewpoint of the flue gases. Other systems attempt to maintain any surface in the economizer with which the flue gases come into contact above the condensation temperature of the flue gases. This reduces the temperature difference between the flue gases and the feedwater in the economizer which has lowered the rate of heat transferred from the flue gases and thus increases the size of the economizer coil.

58796

APTIC NO. 82663

Mertes, Kenneth J.

PORTABLE EXHAUST FUMES EXPELLER DEVICE. (Assignee not given.) U. S. Pat. 3,883,271. 5p., May 13, 1975. 6 refs. (Appl. Jan. 21, 1974, 3 claims).

A portable device adapted to be connected to the exhaust tail pipe of one or more vehicles located inside a closed building and which expels the exhaust fumes from the running engine to the outside of the building is described. The device includes a housing having a multitude of inlet ports with sealing caps; an outlet port in the housing adapted to be connected by a flexible hosing to a discharge opening exterior to the shop, and a centrifugal squirrel cage type blower disposed intermediate to the intake and discharge ports. It is operable at a speed of rotation to draw the exhaust from the vehicle pipe at a greater volume than such exhaust is normally expelled by the vehicle engine. This creates a slight vacuum effect in the system, compensating for any leaks or obstructions. This is an improvement over prior art systems. (Author abstract modified)

CONTROL METHODS

58797

APTIC NO. 79248

Meyers, R. A., J. W. Hamersma, R. M. Aldwin, J. G. Handwerk, J. H. Gary, and J. O. Golden

LOW SULFUR COAL OBTAINED BY CHEMICAL DESULFURIZATION FOLLOWED BY LIQUEFACTION. Preprint, American Chemical Society, Washington, D. C., 13p., 1975. 6 refs. (Presented at the American Chemical Society, Division of Fuel Chemistry, National Meeting, 169th, April 7-11, 1975.)

A combined coal desulfurization-liquefaction process for producing low-sulfur coal is described. Desulfurization is effected by ferric ion leaching to remove pyritic sulfur and hydrogenation to remove a significant portion of the organic sulfur as hydrogen sulfide. After desulfurization, the coal is subjected to batch type coal liquefaction conditions for a residence time of 1 hr and solvent to coal weight ratio of 4:1. The combined process is capable of reducing the sulfur content of typical Eastern coals to the Federal requirement of 0.6 lb sulfur/million Btu.

58798

APTIC NO. 84261

Michaelis, K.

SELECTED EMISSION REDUCING MEASURES IN REFINERY PLANTS WITH SPECIAL REGARD TO GROUND AND HIGH FLARE SYSTEMS.

(Ausgewählte emissionsmindernde Massnahmen an Raffinerieanlagen unter besonderer Berücksichtigung von Boden- und Hochfackel-Systemen). Text in German. *Gesundh.-Ingr.*, 96(10):281-287, 1975. (Presented at the 3rd Symposium on Branch Specific Emissions by Oil Refineries and Petrochemical Plants, Munich, Federal Republic of Germany, March 20-21, 1975.)

Antipollution and antinoise measures undertaken within the framework of a crude oil refinery expansion in West Germany were reviewed. In the smoke stacks, infrared absorption meters to measure sulfur dioxide emission were installed, oxygen was measured by means of a magnetic susceptibility process, the quantity of hot smoke gases was measured with the AN-NUBAR instrument, and quality of smoke gases by an instrument in the base of the chimney and by sampling from a smoke gas ejector, located at a height of 60 m in the stack. In order to reduce hydrocarbon emission, two fixed roof tanks for gasoline were equipped with pressure cooling and connection to an adjacent flare system. As many as 15 floating roof tanks with secondary gaskets were used. Pumps to move crude oil, gasoline, and liquid gas were provided with double gaskets, and three more pumps were utilized for acid water. Oily waste water was conducted through flooded sluiceways to prevent hydrocarbon emission. A flame-ionization detector was used to determine hydrocarbon content in refinery air. A flare system consisting of one ground flare and two high flares were linked to safety vents of hydrocarbon-carrying tanks of the production installation. Their peak efficiency equalled a released heat of about 100 million kcal/hr. Recent measurements of hydrocarbon concentration by means of the flame-ionization detector corresponded to a minimum of 99.5% of flare combustion values. For noise protection, the burners were screened with sound absorbers, incinerating air was sucked in by sound-absorbent coulisses and the workers wore ear plugs. Investment for the measures described ran \$1,220,000. The sound level of all refinery installations at the plant periphery was at 49-50 decibels, provided comparable weather conditions and measuring sites were equal.

58799

APTIC NO. 82572

Michalek, Romuald

ASSESSING NITROGEN OXIDES REMOVAL FROM INDUSTRIAL NON-COMBUSTION SOURCES. Preprint, Engelhard Minerals and Chemicals, Newark, N. J., *Environmental Engineering*, 24p., 1975. 12 refs. (Presented at the Intern. Pollut. Eng. Congr., 4th, Cleveland, Ohio, Oct. 21-22, 1975.)

Various methods for the removal of nitrogen oxides from industrial non-combustion sources are reviewed. A properly designed catalytic system is the most reliable and economical removal means for exhaust streams containing small amounts of oxygen. Certain types of molecular sieves show great potential as adsorbents for nitrogen oxides, but their high capital cost does not justify their use at the present time on a commercial scale. A direct flame reduction system provides the most economical answer for emissions containing very high concentrations of nitrogen oxides. Emissions from nitration processes are an example. Most industrial exhausts containing nitrogen oxides also contain appreciable amounts of oxygen, usually around 20%. These streams are the most difficult to purify, and packed tower absorption is the most frequent method used in these applications. However, large expensive packed towers which provide long residence times must be used to obtain high removal efficiencies. (Author conclusions modified)

58800

APTIC NO. 76322

Michelfelder, S., W. Hartel, and M. P. Heap

THE USE OF A TV-PYROMETER FOR THE CONTROL OF POLLUTANT EMISSION FROM COMBUSTION PROCESSES. *Riv. Combust.*, 29(5-6):217-227, May-June 1975. 12 refs. (Presented at the Italian Flame Days, Sanremo, April 10-11, 1975, Paper K20/a/76.)

The use of a TV-pyrometer for the control of pollutant emission from combustion processes was investigated. In the TV-pyrometer technique the flame image as seen through a TV camera is subdivided in four ranges of equal intensity. The instrument is a detector for thermal emission and for the control of various input parameters in oil flames when the appropriate wavebands are selected by optical filters. A correlation between the video signal from the TV-pyrometer and measured nitric oxide flue gas concentrations in gas flames is possible. (Author summary modified)

58801

APTIC NO. 73495

Miles, Donald L., Louis J. Faix, Harry H. Lyon, and George W. Niepoth

CATALYTIC EMISSION CONTROL SYSTEM FIELD TEST PROGRAM. Preprint, Society of Automotive Engineers, Warrendale, Pa., 18p., 1975. 5 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750179.)

A fleet of nearly 250 cars equipped with experimental catalytic converter systems were tested in taxi, police, state, and municipal fleets in various cities to evaluate the performance and durability of the exhaust emission control devices. The converter systems evaluated were a 260 cu in. underfloor converter and a 140 cu in. manifold converter; both bead and monolith substrates were used. Experimental systems designed for the 1975-76 Federal and California emission requirements for hydrocarbons, carbon monoxide, and nitrogen oxides were successful in controlling average emissions to below these levels for 50,000 mi. Systems designed for achieving 1977 Federal emission standards were also successful for mileages ranging from 20,000 to 25,000; considerable emission system maintenance was necessary, however. Systems designed for 1978 Federal Standards exceeded the emission requirements at very low mileages due to catalyst deterioration. The underfloor bead converter exhibited better durability characteristics than the manifold converter, although both systems were comparable in controlling exhaust emissions. (Author summary modified)

58802

APTIC NO. 76445

Milkins, E. E., H. C. Watson, M. Considine, and G. Sprigg

EMISSIONS CONTROL BY DUAL-FUELLED OPERATION OF A DIESEL ENGINE. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc.*, Rotorua, New Zealand, 1975, p. 234-251. 7 refs. (Feb. 17-21.)

The effect of the addition of liquefied petroleum gas to the inlet air of an unmodified diesel transport engine on exhaust emissions and engine performance was studied. Additions of up to 40% (calorifically were made to a V6 direct injection diesel engine. Carbon monoxide and hydrocarbon emissions generally increased with increasing gas addition; smoke density changed very slightly. Nitrogen oxide emissions were reduced by as much as 50%, and a 12% improvement in thermal efficiency was maintained over half the speed range when 20-30% of the fuel supplied was gas. The reduction in NOx emissions with LPG addition to the inlet air was due to increased ignition delay resulting from gas addition and the reduced oxygen concentration during combustion.

58803

APTIC NO. 82411

Miller, Edward M.

AIR MODULATING FUME SYSTEM. (Industrial Clean Air, Inc., Berkeley, Calif.) U. S. Pat. 3,895,569. 6p., July 22, 1975. 8 refs. (Appl. Sept. 26, 1973, 3 claims).

A fume control system is described in which a canopy type exhaust hood is located in a building a substantial distance above a source of fumes. This design prevents spillage or overflow of the fume and allows the increasingly stringent requirements against air pollution to be met, including occupational health and safety requirements. Cold air is delivered into the building into downwardly open plenum chambers on opposite sides of the hood. The cold air descends around the fumes to form an air chimney for the fumes, thus nullifying disturbance of the fumes from cross winds. The cold air supplies make-up air in the building and prevents or reduces unwanted cross drafts in the building. The size and capacity of the exhaust and air cleaning systems needed for overhead canopy type hoods is reduced in comparison to other systems. (Author abstract modified)

58804

APTIC NO. 82612

Mills, John

PILOT ELECTROSTATIC PRECIPITATOR TESTING. Preprint, Carborundum Environmental Systems, Inc., Knoxville, Tenn., Pollution Control Div., 8p., 1975 (?).

Procedures used for pilot tests of electrostatic precipitator performance are outlined. Information obtained for the sizing and design of a full size precipitator includes: a complete set of operating parameters from the boiler, furnace, kiln, or chemical process; the gas volume through the pilot precipitator; gas temperatures at different points, the outlet dry particulate concentration and moisture content; the total weight of the hopper catch from each field; Orsat gas analysis results; static pressures before and after the precipitator; barometer readings; electrical readings on the rectifiers; the rapping cycle and rapper operation; particle resistivity and size distribution; and sulfur dioxide and sulfur trioxide levels in the case of a fossil fuel plant. Conditions that are purposely varied include: gas temperatures, the fuel or raw material range, conditioning agent quantities, gas velocity, and coal fineness. The average pilot precipitator program requires four to eight persons for the testing period which usually takes about 4 wk.

58805

APTIC NO. 80297

Mills, R. A. and O. J. Tassicker

ANALYSIS OF PILOT PLANT ELECTROSTATIC PRECIPITATOR TESTING IN CONNECTION WITH HUNTLY POWER STATION. The Clean Air Society of Australia and New Zealand, Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 66-91. 9 refs. (Feb. 17-21.)

Pilot-scale electrostatic precipitator tests were conducted at a coal-fired steam plant to provide data relating to the proper sizing of electrostatic precipitators to be installed at a new 1000 MW station in the vicinity. A three stage plate-type pilot precipitator was used for the tests. The specific collecting area was controlled in the range of 28-83 sq m/cu m/sec. Outlet dust concentrations were around 0.02 g/cu m during high effi-

AIR POLLUTION ABSTRACTS, JUNE 1976

ciency tests. Significant changes in performance were not observed with ammonia conditioning, temperature variation, increases in current, and decreased rapping frequency. An increase in dust burden improved performance a small amount. Borecore samples from a coal field which will supply the full size precipitator revealed that the resistivity characteristics of this coal are more favorable than those of the coal used during the pilot tests.

58806

APTIC NO. 83225

Miokovic, Stevan

SYSTEM FOR THE CONTROL OF THE INTAKE AND EXHAUST VALVES OF INTERNAL COMBUSTION ENGINES. (Regie Nationale des Usines Renault; Societe d'ite: Automobiles Peugeot (France)) U. S. Pat. 3,888,216. 9p., June 10, 1975. 13 refs. (Appl. Oct. 2, 1973, 4 claims).

A system for the control of the intake and exhaust valves of internal combustion engines is described. It permits the automatic variation in the valve overlap and the respective open angles during engine operation using two camshafts, one to open the valve, and the other to close it. Each shaft has mutually adjustable timing angles. The rocker arms each have two cam followers one of which contacts a first cam upon one shaft, and the other of which similarly contacts a cam upon the other shaft. (Author abstract modified)

58807

APTIC NO. 82381

Miskiewicz, Leonard A.

AIR FILTER ASSEMBLY. (Assignee not given.) U. S. Pat. 3,898,066. 5p., Aug. 5, 1975. 9 refs. (Appl. Jan. 7, 1974, 8 claims).

An air filter assembly for internal combustion engines is described which provides for greater utilization of the filters capacity. The filter also allows more air to reach the engine, thus resulting in more efficient combustion and reduced exhaust emissions. The filter includes a housing within which an annular filter element is supported for rotation. Turbine blades extend from cover plates at the top and bottom surfaces of the filter element. An air feed pipe opens out of the side wall of the housing and directs incoming air in a direction tangentially toward the annular filter element for contact with the turbine blades extending therefrom. (Author abstract modified)

58808

APTIC NO. 76236

Mitchell, W. J.

AIR POLLUTION CONTROL AT TASMAN PULP AND PAPER COMPANY LIMITED. The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 574-582, (Feb. 17-21.)

Air pollution control procedures being utilized at a Kraft pulping mill are reviewed. Major steps to control the emission of hydrogen sulfide, methyl mercaptan, methyl sulfide, dimethyl disulfide, and particulates include: the installation of a new chemical recovery boiler, black liquor oxidation, the scrubbing of lime kilns emissions, the diversion of smelt dissolving tank gases through the recovery boiler electrostatic precipitator, and the installation of new cyclone collectors on two of three power boilers. Emissions from each stack are monitored about every 6 wk. (Author abstract modified)

58809

APTIC NO. 76261

Mitsuyama, Masaru

MULTI-CYLINDER TYPE INTERNAL COMBUSTION ENGINE WITH REACTOR. (Riakuta o yusuru takito nainen kikan). Text in Japanese. (Toyo Kogyo Co., Ltd., Hiroshima Pref. (Japan)) Japan. Model Util. Sho 50-20203. 4p., June 19, 1975. (Appl. April 30, 1971, 1 claim).

In a multi-cylinder type internal combustion engine where a joint reactor is utilized, the design described here eliminates afterburn and vibrations due to misfire during deceleration, without increasing the unburned components in the exhaust

gas. This engine is comprised of a front and a rear engine, which are supplied with fuel from a common carburetor through a wishbone arrangement of ducts. These ducts also supply air for combustion through a common air cleaner and pressure-sensitive monitors for each engine activated by engine rpm. Unburned components in the exhaust gas are emitted through a baffle plate for each engine into the common reactor for treatment. During deceleration, pressure differences cause primary air to flow into the rear engine, flushing out residual fuel and diluting fresh fuel, if suddenly supplied, to such an extent that no ignition occurs. This diluted air-fuel mixture, suited for combustion of unburned components in exhaust gas, is emitted into the reactor through the baffle plate. There is no accumulation of unburned gases. At the same time, primary air is supplied to the front engine, but in a smaller amount, so that ignition occurs in the front engine. As deceleration continues, fuel is supplied through the idleport in a greater amount to the rear engine, because of pressure differences. No ignition occurs in the front engine, while misfire and irregular ignition are reduced in the rear engine. Vibrations are reduced. Afterburn, upon turning off the ignition switch, is prevented by an influx of excess air into both front and rear engines, which effectively stops further ignition.

58810

APTIC NO. 82311

Miyahara, Kingo

LIQUID FUEL BURNER FOR BURNING LIQUID FUEL IN GASIFIED FORM. (Dowa Co., Ltd., Tokyo (Japan)) U. S. Pat. 3,890,086. 8p., June 17, 1975. 3 refs. (Appl. Aug. 20, 1974, 4 claims).

A fuel burner for burning liquid fuel such as kerosene in gasified form and achieving a sustained complete combustion is described. The burner consists of a fuel gasifying member which is mounted on a rotary shaft extending into the main body of the burner which in turn is formed with a gas chamber along its inner periphery by the mounting of a combustion plate and an inner bottom wall therealong. The fuel gasifying member communicates with the gas chamber, and the fuel supply member is mounted at the forward end of the rotary shaft which is located within the fuel gasifying member. The liquid fuel supplied to the burner quickly diffuses and forms a thin film on the inner surface of the fuel gasifying member's wall so that the liquid fuel is converted to the gaseous form by the heating action of flames produced by the combustion of the liquid fuel in the form of atomized particles. Separate ignition plugs are provided for the initiation of liquid fuel combustion and gaseous fuel combustion. (Author abstract modified)

58811

APTIC NO. 82138

Miyajima, H.

NOX CONTROLLING MEASURES BY EXHAUST GAS CIRCULATION COMBUSTION: EXPERIMENT REPORT ON THE SRG-FGR TYPE BURNER. (Haigasu junkan nensho ni yoru NOx yokusei taisaku: SRG-FGR gata bana no jikken hokoku). Text in Japanese. Kogyo Kanetsu (Ind. Heating), 12(4):255-259, July 1975. 4 refs.

A SRG-FGR (Self Recirculating Gasification-Flue Gas Recirculation) burner was developed to reduce nitrogen oxides emission from flue gas. The burner is an improved type of a previous SRG burner, which reduced NOx concentrations by 22-34% and 65% using crude oil and gas, respectively, as compared to the conventional Tandem burner (Japan Furnace Ind.). The SRG-FGR burner recirculates portions of the exhaust gas into the furnace to reduce the combustion temperature and to prevent the formation of NOx. The NOx concentration is reduced by supplying exhaust gas through multiple nozzles without premixing with air. At 15% FGR, NOx concentration could be reduced by 10 ppm (using crude oil or gas fuel) compared to the SRG burner. With 20% excess air, the NOx concentration is 110 ppm using crude oil and 35 ppm using liquefied petroleum gas. The flame changes to dark red with a 15% increase in length at 15% FGR. Temperature dis-

tribution in the furnace is more homogeneous than that of the SRG burner.

58812

APTIC NO. 83609

Miyaki, Kiyoshi, Akira Okubo, and Sakuji Arai

INTERNAL COMBUSTION ENGINE. (Honda Giken Kogyo Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,884,197. 4p., May 20, 1975. 6 refs. (Appl. July 2, 1973, 4 claims).

An internal combustion engine is described which has a relatively large main combustion chamber and a relatively small auxiliary combustion chamber. The large chamber receives a lean mixture and the small one receives a rich mixture for ignition and projection of a flame into the main combustion chamber through a torch nozzle. The relative proportions of the lean and rich mixtures are maintained so that the resultant overall air-fuel ratio is leaner than the theoretical ratio, to control the generation of nitrogen oxides, carbon monoxide, and other harmful components in the exhaust gases discharged from the main combustion chamber. (Author summary modified)

58813

APTIC NO. 76543

Miyamoto, M., K. Tsukabayashi, and T. Inoda

STUDIES ON STACK GAS DESULFURIZATION BY NOTO DIATOMACEOUS EARTH ZEOLITE, PART 2. (Noto keisodo no zeoraitoka ni yoru haen datsuryu ni kansuru kenkyu dai 2-ho). Text in Japanese. Ishikawa-ken Kogyo Shikenjo Nenpo (Annu. Rep. Ind. Res. Inst., Ishikawa Prefect., vol. 1974:112, Nov. 1975).

The feasibility of using X-type zeolite for flue gas desulfurization was studied. Both commercially available zeolite and the synthesized zeolite from Noto diatomaceous earth were tested for the treatment of flue gas with an 8 to 9 N l/min emission rate and 700 to 800 ppm sulfur dioxide. The absorption of SO₂ was by a stationary bed method with 250 g zeolite at 130 C. The SO₂ absorptivity was related to the % of zeolite content. The zeolite content was 74% and 60% for the commercial and synthesized zeolites, respectively, and their saturation times for SO₂ were 6.75 hr and 5.33 hr, respectively. The repeated use of the same zeolite after desorption treatment resulted in a decreased absorptivity for SO₂. This was because water vapor in the flue gas condensed in the zeolite pores even at a 130 desorption temperature, and the absorbed SO₂ reacted with the water, forming an acid which destroyed the zeolite crystal. Therefore, zeolite cannot be used in flue gas desulfurization without utilizing a preliminary treatment step for flue gases.

58814

APTIC NO. 83204

Miyamoto, Takao, Katsuo Oshikiri, and Shigeru Shingai

ODOR CONTROL SYSTEM FOR KRAFT PULP MILLS. (Kurafuto parupu kojo no dasshu sochi). Text in Japanese. Ebara Jiho (Ebara Times), no. 93:66-67, 1975.

Four installations developed by Ebara Co., Japan, for malodor control in kraft pulp mills are described. A malodorous gas combustion system for blow gas from a batch digester utilizes a gas holder with a special internal diaphragm to make the installation compact. A reduced pressure steam-stripping malodor control installation for condensates utilizes sieve trays to reduce the initial cost and provide ease of maintenance. A normal pressure, condensate-stripping system removes more than 80% of the methanol in the effluent from evaporators and digesters. Steam from evaporators can be utilized here to reduce energy costs. A system developed jointly with MoDo-CHEMETICS Co., Sweden, for combustion of malodorous gases, utilizes a steam ejector to transfer the potentially explosive gases to the combustion chamber from the gas holder. Oxygen concentrations can be as low as 5-6%.

58815

APTIC NO. 80114

Mizuguchi, M. and N. Kumagai

AUTOMATIC DIAGNOSIS FOR EMISSION GAS CONTROL SYSTEM. (Haishutsu gasu joka sisutemu no jido shindan). Text in Japanese. *Jidosha Gijutsu (Automobile Eng.)*, 29(9):843-849, 1975. 2 refs.

An emission gas control system consists of three major parts, the first to prevent the formation of harmful gases in the engine, the second to treat carbon monoxide, hydrocarbon and nitrogen oxides in the exhaust gas, and the third to prevent abnormally high temperature. An automated diagnostic system is composed of an input part and an indicating part. Sensors for the diagnosis detect the signal of the object and the signal is supplied to the input of the equipment via an umbilical cable with a centralized connector. A self-check circuit is used to check the abnormalities of the equipment. A new diagnosis system with sensors collects the test points of every electrical circuit of a thermal reactor type emission control system and directly diagnoses the performances of the thermal reactor.

58816

APTIC NO. 83777

Mlodzinski, Boleslaw and Jerzy Warych

DUST REMOVAL FROM GASES IN A THREE-PHASE FLUIDIZED BED. (Entstaubung von Gasen in dreiphasiger Wirbelschicht). Text in German. *Chem.-Ing.-Tech.*, 47(19):813, 1975. (The full-length text can be obtained from: Verlag Chemie GmbH, Weinheim, Postfach 1260, West Germany).

Investigations were made on dust removal from gases, separation rates and their characteristics in a three phase countercurrent fluidized bed. Dust of superphosphate (wetable type) and zinc sulfide (unwetable type) with grain sizes of 7.0 micron were used in the investigations. With a dust-air mixture a bed was fluidized with water moistened polystyrene spheres of different diameters, densities, and bed heights. It was established that the dust removal rate increases with growing aerosol concentration at the entrance and with increasing moistening up to 50 cu m/sq m hour as well as with an empty pipe velocity up to the point of suspension. The dust removal rate increases further with increasing packing heights to a diameter/height ratio of 1 as well as with a decrease in the diameter of the spheres, especially with the unwetable dust. With wettable dust the dust removal rate is practically independent of the density of the packing; whereas, with the unwetable dust it reaches a maximum with a density of 500 to 700 kg/cu m. Under similar experimental conditions a better separation rate was always obtained for wettable dust.

58817

APTIC NO. 82133

Mondt, James R.

KEEP-HOT CATALYTIC CONVERTER. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,911,675. 7p., Oct. 14, 1975. 5 refs. (Appl. March 25, 1974, 2 claims).

A heating system for maintaining a catalytic converter above a predetermined temperature so that it is effective during engine start-up is described. The heating system includes a small pump which draws an air-fuel vapor mixture from the flue tank and an igniter and pilot burner which are mounted on the catalytic converter. Dilution air is mixed with the air-fuel vapor in the pilot burner and is ignited by a spark plug-like device which is powered by a vibrator coil system. (Author abstract modified)

58818

APTIC NO. 83226

Mondt, James R.

CARBURETOR ENRICHMENT SYSTEM. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,888,223. 6p., June 10, 1975. 7 refs. (Appl. April 12, 1974, 5 claims).

An air-fuel supply system for an internal combustion engine is described. The carburetor is connected to the intake manifold of an engine with a plurality of large diameter vapor ports

formed below the carburetor throttle. A vapor pump draws hydrocarbon vapors and air from the gas tank and from a fuel vapor evaporative control canister having a vent opening thereto and an inlet connected to a vent conduit from the top of the gas tank. The vapor pump is operated during cold engine start to direct a precharge of vaporized fuel and air through the unrestricted vapor ports into the intake manifold for improving cold start operation and emissions. (Author abstract modified)

58819

APTIC NO. 79662

Montagna, Angelo A. and Yatish T. Shah

THE ROLE OF LIQUID HOLDUP, EFFECTIVE CATALYST WETTING, AND BACKMIXING ON THE PERFORMANCE OF A TRICKLE BED REACTOR FOR RESIDUE HYDRODESULFURIZATION. *Ind. Eng. Chem. Process Design Develop.*, 14(4):479-483, Oct. 1975. 8 refs.

The effect of catalyst bed length at constant liquid hourly space velocity or of liquid flowrate on the performance of a trickle bed reactor in hydrodesulfurization of 53% reduced Kuwait crude was evaluated experimentally. Two different catalyst sizes, 7-8 mesh and 20-30 mesh were used. The experimental results are obtained at a temperature of 750 F, a liquid hourly space velocity of 1/hr, and pressures of 1000 and 2000 psig. The experimental data are evaluated on the basis of an axial dispersion model, a holdup model, and an effective catalyst wetting model. All models equally explain the present data for 36% Kuwait crude. The data with 53% reduced Kuwait crude are only moderately correlated by the axial dispersion model. Backmixing, liquid holdup, and effective catalyst wetting are strongly dependent on the catalyst particle size or the viscosity of the feedstock. (Author abstract modified)

58820

APTIC NO. 82481

Montgomery, Thomas L., John W. Frey, and William B. Norris

INTERMITTENT CONTROL SYSTEMS. *Environ. Sci. Technol.*, 9(6):528-533, June 1975. 5 refs.

The intermittent control systems concept is discussed and the Tennessee Valley Authority (TVA) sulfur dioxide elimination programs are described. Intermittent control systems vary emission rates on the basis of existing or predicted meteorological conditions in order to achieve a specified degree of ambient air quality. Active control involves predictions of atmospheric dispersion, feedback control involves feedback from ambient concentration monitors, and passive control is concerned with periodic upgrading of the system. Response times for individual components such as the process or controller are implicitly taken into account. The TVA program includes controls of ground level SO₂ concentrations by means of these systems at nine coal-fired power plants. The TVA plan for such systems is scheduled to be fully operational during 1975 and is designed to bring all TVA coal fired plants into full compliance with primary and secondary ambient SO₂ standards.

58821

APTIC NO. 76402

Moore, Charles W.

CONTROL PA EMISSIONS. *Hydrocarbon Process.*, 54(10):100-103, Oct. 1975. 2 refs. (Presented at the Purdue Industrial Waste Conference, The Control of Phthalic Anhydride Emissions, May 6-8, 1975.)

The sources and control of phthalic anhydride (PA) emissions are reviewed. The two major sources of PA environmental emissions common to all PA processes are the reaction section and the purification section. The hydrocarbons in the waste gas are lachrymators and are present as vapors, liquids, or solids. The waste gas from a PA plant is characterized by large volume, low temperature, low pressure, low heat value of gas-containing air, carbon monoxide, carbon dioxide, lachrymators, and hydrocarbons. The two major control systems are a

CONTROL METHODS

58827

waste gas incinerator with a waste heat boiler which produces steam for export, and a 2-stage scrubber with an incinerator. The 2-stage scrubbing system can remove more than 95% of the total hydrocarbons in the waste gas stream. Due to the limited solubility of CO in water, essentially all of the CO in the waste gas passes through the scrubber to the environment.

58822

APTIC NO. 82373

Moran, Gonzalo

AIR TREATMENT DEVICE. (Commercial Super - Dix, S. A., Madrid (Spain)) U. S. Pat. 3,895,928. 4p., July 22, 1975. 10 refs. (Appl. Sept. 26, 1972, 5 claims).

An air treatment device for purifying and/or deodorizing either small or large indoor spaces is described. The device contains a solid refractory material which acts as a carrier for the air treatment material which is gasified upon heating of the carrier material. The solid carrier material is held in a casing within which an electrically energized heating element is also situated. Upon heating, the air treatment material is liberated and passes through openings in the casing. (Author abstract modified)

58823

APTIC NO. 82046

Morita, Minoru

STRUCTURE OF A ROTOR OF A ROTARY PISTON ENGINE. (Toyota Jidosha Kogyo Kabushiki Kaisha, Aichi (Japan)) U. S. Pat. 3,910,237. 7p., Oct. 7, 1975. 5 refs. (Appl. April 30, 1974, 9 claims).

An improved structure for a rotor of a rotary piston engine is described. This engine counteracts problems of conventional rotary piston engines by preventing the overlapping of the intake and exhaust systems so as to restrict the internal exhaust gas recirculation or remaining ratio. The intake efficiency is improved and the limit of the lean fuel air mixture combustion, moderating the maximum combustion pressure, is broadened. This suppresses the generation of nitric oxide gas by extending the combustion time which reduces the emission of combustible gases such as carbon monoxide and hydrocarbons. The exhaust gas temperature is raised, improving the purifying efficiency of the manifold reactor. Leading and trailing recesses are provided at the peripheral portion of the rotor extending between each of the adjacent apexes, located in front of the rotor contact point at the opening phase of the exhaust port behind the rotor semi-contact point at the closing phase of the exhaust port, respectively, as seen in the rotational direction of the rotor.

58824

APTIC NO. 83124

Morita, Minoru

STRUCTURE OF AN EXHAUST MANIFOLD OF A ROTARY ENGINE. (Toyota Jidosha Kogyo Kabushiki Kaisha, Toyota (Japan)) U. S. Pat. 3,898,804. 7p., Aug. 12, 1975. 4 refs. (Appl. April 30, 1974, 7 claims).

A structure of an exhaust manifold of a multi-rotor type rotary engine is described. Individual exhaust ports corresponding to individual combustion chambers are connected to a common manifold reactor. The lines of ejection of the individual exhaust ports cut one another at a point located within a space confined in the manifold reactor. This structure overcomes the problems in conventional rotary engines in which a high cooling rate is caused by the exhaust gases while they are flowing through the exhaust port, thus causing a lower exhaust gas temperature in the reactor and deterioration of the recombination effect of the reactor, especially when the engine is in a cold condition. (Author abstract modified)

58825

APTIC NO. 82049

Morrall, James W.

MEANS FOR PURIFYING THE EXHAUST DISCHARGE OF INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,910,762. 6p., Oct. 7, 1975. 11 refs. (Appl. Jan. 15, 1973, 8 claims).

A device for purifying the exhaust discharge of internal combustion engines is described. The device includes a housing within which is a heat retaining member formed from unglazed porous ceramic material. It is arranged so that the exhaust gases pass over its outer surface in a space between the heat retaining member and the inner wall of the housing. Air enters the housing before the exhaust stream comes into contact with heat retaining member. Solid particles of carbon and incompletely burnt gases are subject to a sufficient temperature for a sufficient period of time in an atmosphere containing sufficient oxygen to promote further combustion. Carbon, hydrocarbons, lead oxides, and hydrogen are burnt and CO is oxidized to carbon dioxide. This CO₂ is discharged to the atmosphere, and the residue of the burnt constituents is deposited on the heat retaining member. The efficiency of the process increases with increase in temperature of the heat retaining member so that those arrangements positioned closest to the engine have the greatest efficiency.

58826

APTIC NO. 83098

Morton, David W.

FILTER WITH INTEGRAL HOUSING. (Donaldson Co., Inc., Minneapolis, Minn.) U. S. Pat. 3,880,627. 5p., April 29, 1975. 16 refs. (Appl. July 2, 1973, 8 claims).

An integrally formed air filter assembly of the throw-away type is described. A pair of U-shaped housing members are oppositely disposed with leg portions of one member telescopically received between leg portions of the other member to form a housing. An inlet is formed in one housing member and an outlet is formed in the other housing member. Cup shaped end walls engage and embrace opposite end edges of the housing. A pleated filter is positioned in the housing with its opposite end pleats, and a seal positioned adjacent to each, disposed between adjacent telescoped leg portions. An adhesive material partially fills each of the cup shaped end walls and has an adjacent portion of the pleated filter, and an adjacent end edge of the housing embedded. The adhesive material cooperates with the seals between the leg portions to secure and seal the pleated filter in the housing to provide a filtering medium between the inlet and outlet and bond the filter assembly into an integral unit. Conventional air filters are of a considerable housing bulk and require expert servicing. This filter can be modified to fit a variety of limited installation space configurations and has easy maintenance. (Author abstract modified)

58827

APTIC NO. 82993

Moss, Gerald

PROCESS AND APPARATUS FOR THE PRODUCTION OF COMBUSTIBLE GASES. (Exxon Research and Engineering Co., Linden, N. J.) U. S. Pat. 3,870,480. 11p., March 11, 1975. 4 refs. (Appl. March 15, 1972, 21 claims).

A process for producing substantially sulfur free fuel gas from coal by gasification of particles of coal with a steam/oxygen mixture at an upstream end of a bed of fluidized particles containing an alkaline earth metal oxide is described. Sulfur from the coal is fixed in the particles as alkaline earth metal sulfides. The bed particles travel generally downstream towards a regenerator, and at the downstream end, oil is injected into the bed and gasified to compensate for the reduced coal concentration at the downstream end to avoid dilution of the fuel gas. Bed material from the downstream end is contacted with oxygen or air to convert sulfides to oxides. Sulfur dioxide is liberated and recovered and the oxides containing regenerated particles are returned to upstream end of the bed. In other systems, a larger reactor is required because the coked coal particles are not substantially different in size from the original coal particles and the oxidation of these masses requires a long residence time. This is in marked contrast to the ease of oxidation of the flowable hydrocarbons. (Author abstract modified)

58828

APTIC NO. 80164

Mozes, M. S.

REGENERATIVE AMMONIA PROCESS FOR DESULPHURIZATION OF FLUE GAS. Ontario Hydro Res. Quart., 27(2):19-28, 1975. 18 refs.

An ammonia recovery process for scrubbing sulfur dioxide from power plant gases is described, in which the ammonium bisulfite effluent from conventional ammonia type scrubbers undergoes almost total regeneration in two stages. In the first stage the effluent is acidified with ammonium bisulfate to strip the sulfur dioxide and reduce the outflow to ammonium sulfate. In the second stage the sulfate is thermally decomposed into ammonia and ammonium bisulfate for recycling to the scrubber and the stripper, respectively. Experimental studies were performed on each stage. Reaction rates and activation energy were obtained for the first stage. Factors studied for the second stage include kinetics of decomposition and the effect of nitrogen flow rate, equilibrium pressure of ammonia, and composition of the residue. An overall SO₂ removal efficiency of 90% is expected. (Author abstract modified)

58829

APTIC NO. 82371

Mueller, James H.

HIGH EFFICIENCY, THERMAL REGENERATION ANTI-POLLUTION SYSTEM. (Assignee not given.) U. S. Pat. 3,895,918. 8p., July 22, 1975. 8 refs. (Appl. Jan. 16, 1973, 11 claims).

A system for oxidizing or thermally processing fumes and odors is described which utilizes thermal regeneration to conserve fuel. The system consists of a cylindrical purification chamber with a refractory-lined dome. At least three flue-heat exchange bed combinations are located at the periphery of the dome and are bounded by vertical walls defining horizontal cross sections in the shape of a catenary curve. The heat exchange bed includes ceramic packing held toward the inner side by angled louvers. Several angled vertical baffles are positioned in front of the louvers to lengthen the flow and hence the dwell time of the process gas within the central chamber. (Author abstract modified)

58830

APTIC NO. 76599

Muenk, R.

PLANETARY COOLERS FOR LARGE ROTARY KILNS. (Planetenkuehler fuer grosse Drehrohroefen.) Text in German. Zement-Kalk-Gips (Wiesbaden), 28(11):447-454, 1975. 1 ref.

In recent years large rotary kilns have increasingly been equipped with planetary coolers. The capital cost, electric power consumption, cost of repairs, and environmental effects of this type of cooler are discussed. The various designs of planetary coolers are dealt with, especially the internal fittings in the cooler, the construction of the inlet elbows and outlets, and the attachment and suspension of the planetary cooling tubes. The operating results obtained with the planetary cooler of the 3000 t/d cyclone preheater kiln at the Mark II B cement manufacturing plant at Beckum are reported, and various modifications in design and in features of process technology with a view to improving the cooling effect and noise abatement are described. The operational availability and trends of development of this type of cooler in new kiln plants are discussed.

58831

APTIC NO. 83370

Muermann, Herbert

STATIONARY DUST SUCTION SYSTEMS. (Stationaere Staubsauganlagen.) Text in German. Wasser Luft Betrieb, 19(12):698-701, 1975.

High-capacity stationary vacuum cleaners for industrial plants, hotels, hospitals, and other large buildings are described. The stationary vacuum cleaner is composed of a high-capacity ventilator, a first stage for the separation of coarse particles, and

of a second stage for fine dust separation. The first stage can be a simple gravitational separator for low capacities, or centrifugal separator for large-capacity units. The second stage is a tissue filter, from which the dust is removed by shaking by hand. The installation of a vacuum line permits the connection and simultaneous use of several suction heads. The central suction system has the advantage of preventing the whirl-up of dust.

58832

APTIC NO. 83712

Muermann, H.

DUST EMPTYING EQUIPMENT FOR FILTERS AND DUST COLLECTORS. (Staubabfuellvorrichtungen fuer Filter und Abscheider.) Text in German. Wasser Luft Betrieb, 19(8):462-464, Aug. 1975.

Dust collectors generally operate under reduced pressure. The suction ventilator is fitted to the collector in order to avoid wear, caking of dust, imbalance and obstruction of ventilator vane wheels. A simple discharge element for passing on dust is the pendulum sluice. Its function requires a certain height for the dust column above the valve, which may be reached by incorporating a supporting pipe above the sluice. The BAHCO universal valve, operated by hand or compressed-air cylinders, has been fitted with a hopper to provide discharge behind dust collectors. The bucket wheel sluice has proven effective for uniform air exclusion, continuous dust discharge and the drawing-off and transport of materials. Transport screws fitted below the dust funnel serve to carry accumulating dust to the sluice.

58833

APTIC NO. 83662

Muir, Arthur J.

HOT GAS COOLING WITH SONIC NOZZLES. Plant Eng., 29(13):69-70, June 26, 1975.

Hot gas cooling using sonic nozzles is discussed. Use of the sonic nozzles with a cascade feedforward control system, makes it possible to automatically modulate water flow to suit varying inlet gas conditions. The system takes full advantage of the modulation capabilities of the sonic nozzles and provides rapid system response. A complete cooling system includes cooling chamber, sonic atomizing nozzles, temperature sensors, automated flow controls, and air compressor. Systems are designed to use only the volume of water required to accomplish proper cooling. Size of the equipment is minimized, and wetted walls, refractory spalling, sludge buildups, carryover, and recycling problems are prevented. A temperature sensor at the gas inlet dictates the liquid flow rate to the nozzles. A downstream temperature sensor corrects for system errors and prevents the occurrence of excessive temperatures in the collection chamber.

58834

APTIC NO. 83090

Munakata, Eiji and Eisuke Munakata

AN IMPROVED METHOD AND DEVICE FOR REDUCTION OF SULFUR CONTENT IN MINERAL OIL.

(Koyu no ioubun o jokyoshite iou ganyuryo o teigen seshimeru hoho no kairyo oyobi sono sochi.) Text in Japanese. (Munakata, Eiji (Japan)) Japan. Pat. Sho 50-30643. 4p., Oct. 2, 1975. (Appl. May 28, 1970, 2 claims).

An improved method and device to reduce the sulfur content in mineral oil, in which the oil is desulfurized by the catalytic reduction method using a countercurrent of hot water above 100 C, is described. In this method, a certain weight percentage of hot water and sulfur containing mineral oil must be controlled proportionately, and the hot water extraction method is utilized. The specific gravity of the sulfur containing oil is also adjusted to control the differences in specific gravity between the hot water and the mineral oil containing sulfur. The process presents a device which consists of a high pressure vertical hot water extraction cylinder with a hot water inlet and desulfurized mineral oil outlet on the top and a hot mineral oil inlet and a sulfur containing hot water outlet at the

bottom, an oil tank, a water tank, a refined oil tank and a waste water tank. The inertia of the extraction cylinder may be designed specially to promote a countercurrent catalytic reduction or may contain fillers or porous plates. The preheated mineral oil containing sulfur and the hot water enter the cylinder, are treated by the countercurrent, and exit through the heat exchanger to the refined oil tank and to the waste water tank.

58835

APTIC NO. 80457

Murai, Ikuro

PLANS FOR STACK GAS DESULFURIZATION FACILITIES. (*Haiken datsuryo sochi no keikaku*). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(10):884-894, 1975.

Plans for stack gas desulfurization facilities at two power plants (each 450 MW) are summarized. The wet-type, sodium sulfite-gypsum desulfurization process, used at both plants, was developed jointly by Goh Chemical Industries and Kawasaki Heavy Industries. In this automated process, sodium sulfate, formed in the initial SO₂ absorption procedure, is converted to sodium hydrogen sulfite by calcium sulfite, and recovered finally as sodium sulfate for reuse. Slight amounts of magnesium, present with calcium carbonate, becomes magnesium sulfate in the oxidation tower, and are finally removed in cake form as the hexahydrate of magnesium sulfite. The desulfurization facility now under test operation, covering 10,500 sq m, treats a gas volume of 1,260,000 N cu m/hr, through two absorption towers of equal capacity, at inlet temperature of 140 C, for SO₂ concentration of 1070 ppm. Desulfurization rate after reheating was 90%. Boiler fuel sulfur content was 2.0%. The facilities were designed for maximum efficiency and safety. Corrosion resistant materials were used. Various trip switches and damper closures are automatically activated for shutdowns. However, the bypass stack is always open to gas flow. When regeneration facilities are not functioning, absorption towers can remain in operation for 5 days, with the addition of sodium hydroxide, to desulfurize the regular load.

58836

APTIC NO. 82960

Murakami, Yoshio

TOXIC COMPONENT ABSORPTION, REMOVAL AND WASHING DEVICE FOR AUTOMOBILE EMISSION GAS. (*Jidosha niokeru haikigasochu no yudoku seibun no kyushu jokyō senjo sochi*). Text in Japanese. (Murakami, Yoshio (Japan)) Japan. Pat. Sho 50-28565. 4p., Sept. 17, 1975. 1 ref. (Appl. Jan. 13, 1970, 1 claim).

A washing device that absorbs and removes noxious and toxic components from auto exhaust gas is described. This device uses oil and has an automatic pressurized exhaust. The main characteristic of this process is the use of oil to absorb and remove toxic substances, and the recyclability of the contaminated oil after purification. An initial process uses an alkali washing solution to remove carbon monoxide and 4-ethyl lead. A secondary process uses lubricating oil to complete absorption and removal. A tertiary process uses activated carbon to absorb malodorous and toxic elements and to finalize the cleaning before the release of odorless, harmless gas into the atmosphere. The basic parts of the device are: a washing tank containing an alkali solution, a washing tank containing oil with a high ignition point, and a foreign matter removal tank.

58837

APTIC NO. 84223

Muroi, A.

DRY DENITRIFICATION OF STACK SMOKES (PARANOX). (*Kanshiki haiken dassho sochi, PARANOX*). Text in Japanese. Haikan gijutsu (Piping Eng.), 17(9):125-129, July 1975.

The PARANOX process of denitrification of stack smoke, developed by Japan Volatile Oil Co., is a dry selective contact reduction process using ammonia as the reducing agent to

yield nitrogen and water and using a parallel passage reactor. Since NO nitrogen oxides stack gas are reduced and broken down to N₂ and nitrous oxide, which are harmless, there is no waste treatment involved as in wet systems. Ammonia is inexpensive and readily available, making running cost low. The process is simple and operation is automated. No operator is required under normal operating conditions. A parallel passage reactor ensures that there is no clogging by dust. The catalyst used can withstand sulfur oxides, so that dirty gas, not yet desulfurized, may be treated. The catalyst used does not cause secondary pollution as it does not contain any pollutants, either during operation of PARANOX or when waste catalyst is being treated. By combining this process with a desulfurization process, economical and practical systems can be designed. Peripheral technologies necessary for the operation of PARANOX were also developed. Several catalysts have been developed, having alumina compounds as bases, and mainly consisting of non-metal compounds.

58838

APTIC NO. 76523

Musick, James K. and Frederick W. Williams

HOPCALITE CATALYST FOR CATALYTIC OXIDATION OF GASES AND AEROSOLS. *Ind. Eng. Chem. Prod. Res. Develop.*, 14(4):284-286, Dec. 1975. 7 refs.

Thirty six gases and aerosols mixed with air were exposed to hopcalite catalyst in a laboratory scale catalytic burner under operating conditions similar to those used in submarine burners. Various catalyst temperatures in the range 200 to 423 C were used. The 36 gases and aerosols included hydrogen, hydrocarbons, oxygenated compounds, nitrogen compounds, sulfur compounds, a diesel fuel, a lubricating oil, a triaryl phosphate hydraulic fluid, and a paint thinner. The extent to which the different gases and aerosols were oxidized in the burner was measured by various analytical methods. The compounds were classified into two groups: 35 compounds were susceptible to decomposition catalyzed by hopcalite and one was resistant. (Author abstract)

58839

APTIC NO. 73417

Nagai, Akio, Mitsugu Ooishi, and Masao Watanabe

AN AUTOMATIC FUEL-STOPPING DEVICE FOR ENGINE DURING DECELERATION. (*Engin gensokudoki no nenryo shadan sochi*). Text in Japanese. (Honda Motor Co. Ltd., Tokyo (Japan)) Japan. Pat. Sho 50-3446. 4p., Feb. 5, 1975. (Appl. Oct. 18, 1971, 1 claim).

An automatic fuel stopping device that acts during engine deceleration is described. A supporting pressure line is added between the fuel tank to the fuel pump; it contains a valve which is connected to the intake manifold of the carburetor through a vacuum line. Whenever the engine is decelerating, the pressure within the intake manifold decreases, which opens up the valve in the supporting line. When the valve opens, the inside pressure of the fuel line to the fuel pump becomes equal to the atmospheric pressure and a spring operating another valve in the fuel line closes and stops the fuel flow to the carburetor. The device also includes a system that activates and deactivates the above mechanism depending upon the engine temperature, and this is achieved by installing a second valve which opens and closes the vacuum line. This valve is operated electrically through a thermostat placed on the engine and closes only when the engine is cold.

58840

APTIC NO. 83148

Nagai, Masahhi, Kazuhito Miwa, Masakazu Tsunetsugu, and Tadamaro Fujiwara

RECYCLE ENGINE APPARATUS. (*Hitachi Shipbuilding and Engineering Co., Ltd., Osaka (Japan)*) U. S. Pat. 3,871,343. 14p., March 18, 1975. 10 refs. (Appl. July 17, 1974, 17 claims).

An apparatus for operating an engine by recycling exhaust gas to the engine intake is described. It includes a recycling system provided with means for discharging excess exhaust

gas and controlling the working pressure in the system. The volume of oxygen introduced into the recycling system to form a combustion gas and the O₂ supplied to the system in proportion to the fuel supplied to the engine are automatically controlled. Other features provide for purging of the system prior to engine start and for the removal from the system of water resulting from combustion. Optional non-cycling or normal operation is provided for together with recycling operation of the engine under submerged conditions. (Author abstract modified)

58841

APTIC NO. 82073

Nagai, Tadashi, Hitoshi Irikura, and Kiminobu Sasa

APPARATUS FOR SUPPLYING FUEL TO A DUAL CATALYST EXHAUST TREATMENT SYSTEM.

(Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,908,371. 21p., Sept. 30, 1975. 17 refs. (Appl. Nov. 16, 1972, 3 claims).

An air pollution preventive system for motor vehicle engines is described. In this system, oxidizing and reducing catalysts are positioned in series in an exhaust system of the engine. The reducing reactions take place in the system so that the carbon monoxide and hydrocarbons act to reduce the nitrogen oxides to non-polluting nitrogen gases. An air-fuel mixture is supplied to the engine which is proportional to an air-to-fuel ratio in a range between a stoichiometric value and a value appreciably higher than the stoichiometric air-to-fuel ratio. A reducing agent is mixed with the exhaust gases emitted from the engine into the exhaust system. The resultant mixture is passed through a reducing catalyst for removing an excess of oxygen and reducing NO_x in the exhaust gases. Secondary air is mixed with the resultant exhaust gases leaving the reducing catalyst. The resultant mixture of the exhaust gases and the secondary air is passed through an oxidizing catalyst for oxidizing CO and hydrocarbons in the exhaust gases.

58842

APTIC NO. 82953

Nagamatsu, Katsuhiko

WET TYPE STACK GAS DESULFURIZATION FACILITY. (Shitsushiki haen datsuryu sochi ni suite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(12):1117-1126, Dec. 1975.

Wet type stack gas desulfurization facilities developed by Mitsui Miike Seisakusho are described. The following desulfurization devices are discussed: Mitsui Gypsum Method type stack gas desulfurization/dust precipitation device, a utility model 250 MW gypsum method type stack gas desulfurization device for a coal fired steam power plant completed in November 1974, the Mitsui Magnesium Method developed using the technology of the Chemico Co. and Mitsui Mitsuike, a utility model magnesium oxide method stack gas desulfurization device for chemical plants and oil fired steam power plants completed in August 1974, and a Chemico type venturi scrubbers. The utility models of the Mitsui Gypsum Method type and Mitsui Magnesium Method type stack gas desulfurization devices have been installed in the Takasago Steam Power Plant of Dengen Kaihatsu, the Chiba Petroleum Refinery of Indemitsu Kosan, and Mitsuike Steam Power Plant of Mitsui Aluminum, and are operating successfully.

58843

APTIC NO. 76303

Nagata, K.

NOX CONTROLLING MEASURES BY COMBUSTION TECHNOLOGY (I). (Nensho gijutsu ni yoru NOX yokusei taisaku (I)). Text in Japanese. Kogyo Kanetsu (Ind. Heating), 12(4):264-270, July 1975.

Nitrogen oxides control by combustion techniques is discussed. Low NO_x burners employing mix promotion, flame division, or self-recirculation techniques are used to reduce NO_x. Other techniques including two-stage combustion, off-stoichiometric combustion, exhaust gas recirculation, and steam injection are also widely applied. The reduction of ther-

mal NO_x is due to the decrease in combustion temperature, the decrease of oxygen concentration in the combustion region, or the decrease of residence time of the combustion gas in the high temperature region. Results of the investigation of 114 plants in western Japan revealed that 59% had NO_x control equipment, including 19% with exhaust recirculation, 17% with low NO_x burners, 13% with combustion at low load, and 10% each with multi-stage combustion and steam injection.

58844

APTIC NO. 82390

Nahas, Nicholas C. and Edward L. Wilson

TRANSFER LINE BURNER SYSTEM. (Exxon Research and Engineering Co., Linden, N. J.) U. S. Pat. 3,891,402. 8p., June 24, 1975. 15 refs. (Appl. June 25, 1973, 5 claims).

A transfer line burner system for use in coal gasification and similar operations is described which overcomes prior art difficulties related to incomplete combustion and plugging. An oxygen-containing gas is injected into the burner at two or more separate points, and the distribution of this gas is regulated to minimize ash fusion and the formation of carbon monoxide. The oxygen-containing gas is preferably introduced at a point near the lower end of the burner and at one or more additional points downstream from the first point. The amount of oxygen introduced at the first point must be sufficient to generate a substantial portion of the heat required to raise the solids in the burner to the desired temperature. The oxygen thus provided is quickly consumed in burning carbon to form carbon dioxide. As the gaseous products and unburned solids move upwardly within the burner, the carbon dioxide is partially reduced to carbon monoxide. The amount of oxygen introduced downstream from the first point must be sufficient to burn all of the carbon monoxide to carbon dioxide and provide additional energy for heating the unburned solids. (Author summary modified)

58845

APTIC NO. 82020

Nakada, Masahiko

EXHAUST GAS PURIFICATION SYSTEM. (Toyota Jidosha Kogyo Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,903,695. 4p., Sept. 9, 1975. 6 refs. (Appl. Oct. 9, 1973, 4 claims).

An exhaust gas purification system for internal combustion engine wherein secondary air is injected into the exhaust pipe is described which overcomes prior art disadvantages associated with explosive combustion (afterburning). The system is provided with an afterburning prevention air supply pipe adapted to supply a portion of the secondary air delivered from an air pump driven directly by the engine into the fuel intake means of the engine. A control valve is located midway in the afterburning prevention air supply pipe and is opened only when a sudden increase in the negative pressure in the fuel intake means of the engine occurs. Means are provided for inhibiting the opening of the control valve when the discharge pressure of the air pump is below a predetermined level to insure that the air for preventing afterburning is provided to the fuel intake means only during a desired phase of operation. (Author abstract modified)

58846

APTIC NO. 83315

Nakaguchi, Glenn M.

DETERGENT AUTOMOTIVE FUEL COMPOSITION. (Union Oil Co. of California, Los Angeles) U. S. Pat. 3,884,647. 6p., May 20, 1975. 3 refs. (Appl. Aug. 9, 1973, 10 claims).

Effective detergents for removing and preventing the formation of gums and other deposits in flue induction systems were developed. These deposits contribute to atmospheric pollutants by virtue of incomplete fuel combustion resulting from maladjustments in air/fuel ratios which such deposits bring about. Certain N-long branched chain alkyl, N-hydroxyalkyl alkylene polyamines, when added to automotive hydrocarbon fuels in

very small proportions are effective detergents. These additives exhibit a substantially lesser tendency to emulsify water in the fuel than other presumably analogous compositions. Compositions of the prior art are substantially inferior in detergency as compared to these hydroxyalkyl polyamines. (Author abstract modified)

58847

APTIC NO. 82691

Nakajima, Yasuo and Yoshimasa Hayashi

AUTOMOBILE EXHAUST PURIFICATION DEVICE WITH A CHANGEOVER SWITCH. (Kirikae suitchi tsuki haikijoka sochi). Text in Japanese. (Nissan Motor Co., Ltd. (Japan)) Japan. Model Util. Sho. 50-37459. 4p., Oct. 31, 1975. (Appl. May 30, 1969, claims not given).

An exhaust purification device with a changeover switch is described which will improve the operational performance of the automobile engine with an emission control device during cold operation, and activate the exhaust purification device during an initial cold start. Conventionally, exhaust purifiers which use an exhaust recirculation process and an exhaust recombustion process have both processes in operation regardless of cold or hot engine operation. However, the nitrogen oxide emission level is very low during cold engine operation, and recirculation of the exhaust gas into the combustion chamber interferes with combustion and results in poor operational performance of the vehicle. On the other hand, during cold operation of the engine, a large amount of uncombusted hydrocarbons is emitted, which requires activation of the recombustion process. The recombustion process is not necessary during hot engine operation when the emission of hydrocarbons is minimal. Therefore the purification device is provided with a changeover switch to select either process as required for the best performance from either a cold or warm engine.

58848

APTIC NO. 82692

Nakajima, Yasuo and Takeharu Oguri

CATALYST CONVERTER FOR EMISSION GAS PURIFICATION OF INTERNAL COMBUSTION ENGINE. (Nainenkikan no haikigasu jokayo shokubai konbata). Text in Japanese. (Nissan Motor Co., Ltd. (Japan)) Japan. Model Util. Sho 50-36092. 4p., Oct. 21, 1975. 2 refs. (Appl. July 30, 1970, claims not given).

A catalytic converter for emission gas purification of an automobile internal combustion engine is described, which can detoxify carbon monoxide and hydrocarbons in the exhaust gas. Conventional catalytic converters are not designed for convenient replacement of the wornout catalysts, and the unit is expensive because of the installation of a bypass for heavy load operation. The newly developed catalytic converter is removable, and has two inter-connecting chambers each filled with a horizontal layer of catalyst particles and divided by a wall. The new converter is installed with flanges under two openings in the exhaust pipe. Another design characteristics is a valve between the openings in the exhaust pipe which will interrupt the flow of gas through the catalysts during heavy load operation and overheating of catalyst bed. The rest of the time, the gas enters into one chamber from the top, then flows downward and sideways into the other chamber. Then the gas flows upward and exits from the top of the other chamber.

58849

APTIC NO. 82840

Nakamoto, Teruyuki, Yoshioki Shingo, Tetsuo Yamaguchi, and Yukio Endo

CATALYST ASSEMBLY FOR REMOVING NOXIOUS GASES FROM AUTOMOBILE EXHAUST. (Fujikura Densen Kabushiki Kaisha (Japan)) U. S. Pat. 3,883,443. 7p., May 13, 1975. (Appl. April 16, 1973, 12 claims).

A catalyst system that is capable of reducing nitrogen oxides to harmless nitrogen is described. The catalyst has improved mechanical and chemical strength, improved durability, greater gas permeability, and reduced pressure loss in comparison to

other systems. The catalyst system consists of a plurality of highly gas permeable catalyst layers composed of a copper-nickel catalyst, and a plurality of highly gas permeable separating layers composed of a ferrous material. The plurality of catalyst layers are supported and isolated from each other by the separating layers. (Author abstract modified)

58850

APTIC NO. 82304

Nakamura, Harutoki

AUTOMOTIVE EXHAUST GAS CATALYST. (Matsushita Electric Industrial Co., Ltd., Kadoma-shi (Japan)) U. S. Pat. 3,897,366. 8p., July 29, 1975. 7 refs. (Appl. Nov. 5, 1973, 3 claims).

An automotive exhaust gas catalyst which provides improved heat dissipation and thus extended service is described. The catalyst is divided into several small catalyst chambers which are divided by doughnut-shaped partition walls which are heat conductive. Mesh like catalysts whose carriers are fabricated of alkaline-free glass fibers are situated in each of the chambers. The exhaust gas introduction passage is gradually reduced in cross section toward the discharge end of the catalyst casing. (Author summary modified)

58851

APTIC NO. 80338

Nakamura, Tatsuo, Hiroaki Sakanaka, Soji Mizuno, and Toshiyuki Nakagawa

AIR CLEANER WITH NOISE DAMPER FOR INTERNAL COMBUSTION ENGINE. (Nainen kikan no shoon sochi tsuki ea kurina). Text in Japanese. (Kubota Ltd. (Japan)) Japan. Model Util. Sho 50-20173. 2p., June 19, 1975. 1 ref. (Appl. May 29, 1970, 1 claim).

An air cleaner with a noise damper for better dust removing efficiency and noise prevention is described. Upper and lower filtering elements are attached to a cylinder with a number of holes. Air is introduced through the upper filtering element into the upper part of the cylinder. Air passes through a number of holes in the upper part of the cylinder to the lower filtering element, where it is double filtered. The clean air enters the cylinder through holes in the lower part of the cylinder. Noise is prevented by the repeated diversion of the air flow, which eliminates the noise pressure, and by expansion chamber between the two filtering elements.

58852

APTIC NO. 83692

Nakamura, Tokuhiko

INTERNAL COMBUSTION ENGINE. (Nainen kikan). Text in Japanese. (Toyota Motor Co., Ltd. (Japan)) Japan. Pat. Sho 50-35965. p. 19, Nov. 20, 1975. 3 refs. (Appl. June 24, 1972, 2 claims).

An internal combustion engine which can swiftly lower the maximum gas temperature generated from the combustion of the air/fuel mixture so that the nitrogen oxides generated in the combustion gas will be reduced is described. It is generally known that when the combustion gas temperature of an engine exceeds 1800 C, nitrogen and oxygen in the combustion gas will be bonded and produce nitrogen oxide. The speed of this chemical reaction increases logarithmically with temperature. Therefore, a slight reduction of temperature can reduce a large amount of nitrogen oxides. The characteristic of this process, compared to the conventional processes which require additional equipment such as a pump and a gas passage, is simply a change in the shape of the piston or cylinder head, incorporating the use of thin plate-type fins which dissipate the high temperature combustion gas heat during burning of the air/fuel mixture. The fins are made of aluminum alloy are 2 to 5 mm wide, and are placed 2 to 3.5 mm apart. This can effectively control the generation of nitrogen oxides. This process can be applied to existing engines with only slight modification of the engine parts or design.

58853

APTIC NO. 84000

Nashan, Gerd

THE BYPRODUCTS OF HARD COAL COKING. (*Die Kuppelprodukte der Steinkohlenverkokung*). Text in German. *Erdoel Kohle-Erdgas- Petrochem.*, 28(12):562-566, 1975.

In coal coking the by-products obtained are gas, tar, benzene, nitrogen and hydrogen sulfide. The split-off point, determining the existence of specific by-products, and the break-even point, indicating the profitability, establish the economy of their production. The sum of net profits for coal products and coke oven gas are insufficient to warrant substantial value to coal charges. Economical use of by-products is considered in the evaluation of volatile coking coal components. Alternative possibilities of obtaining those products with respect to the German Federal Energy Program are discussed along with the problems relative to coal gasification, direct coal hydrogenation and preliminary degassing.

58854

APTIC NO. 76425

Nasuno, A.

ON THE FILTER-BAG BY SPECIFIC ELECTROCONDUCTIVE FIBERS. (*Tokushu dodensei seni ni yoru firu-ta bagu ni tsuite*). Text in Japanese. *Nenryo oyobi Nensho (Fuel and Combustion)*, 42(11): 977-987, Nov. 1975.

Incidences of static shock, filter bag explosion, and deterioration in filtration efficiency due to static adhesion of particulates to filter bags are increasing. To eliminate static problems, specific electroconductive fibers (Serumekku brand) were successfully developed and marketed as filter bags by the Kuraray Co. Serumekku is produced by coating various electroconductive metals on various types of fibers using specific chemicals and techniques. Descriptions of the type and production method for metallic fibers, carbon fibers, and organic fibers containing electronconductive substances are given. The characteristics of Serumekku fibers are given in comparison with those of other fibers. Descriptions of electrostatic phenomena, problems, and accidents caused by static electricity and its countermeasures are also given. Using Serumekku fibers as materials, filter bags with excellent antistatic properties were obtained.

58855

APTIC NO. 83107

Nebgen, William H.

GASIFICATION METHOD WITH FUEL GAS COOLING. (*Brayton Cycle Improvement Assoc., New York*) U. S. Pat. 3,882,671. 6p., May 13, 1975. 10 refs. (Appl. Jan. 2, 1974, 6 claims).

An improved Brayton cycle was developed which utilizes clean fuel from the gasification of dirty fuel and operates with greatly reduced loss of energy and with improved conversion efficiency. An open Brayton cycle, preferably with refrigerated air intake, is operated with dirty fuel containing contaminants which are chemically corrosive or which in the gasification of the fuel are transformed into high sulfur coal, high S fuel oil or fuel containing vanadium compounds. The dirty fuel is first gasified by partial combustion with hot air, enriched air, or oxygen, then dry-quenched by contact with cool combustion gases to a temperature at which contaminants such as hydrogen sulfide are no longer corrosive to steel, then cooled, preferably in a waste heat boiler. Solid and/or corrosive gaseous contaminants are removed. Refrigerated atmospheric air is compressed and heated by heat exchange with Brayton cycle turbine exhaust gas. A portion is used as combustion air in the Brayton cycle combustor and a portion is used for partial oxidation of the dirty fuel. The combustor receives cool, clean gas from the partial oxidation, and is heated by heat exchange with turbine exhaust gases. After combustion the combustion gases are passed through the open Brayton cycle turbine. (Author abstract modified)

58856

APTIC NO. 76292

Nedea, Ede and Nandor Tamaskovics

AIR POLLUTION FORMATION IN NATURAL GAS-FIRED INDUSTRIAL FIRING CHAMBERS. (*Legszennyezo anyagok kepzodesa a foldgastuzelesu ipari tuzterekben*). Text in Hungarian. *Energiagazdalkodas*, 16(5):213, 216, May 1975. 14 refs.

The mechanism of nitric oxide formation in natural gas-fired industrial combustion, and abatement of the nitrogen oxides emissions from such installations are reviewed. The formation of NO in the combustion chamber is dependent on the oxygen concentration of the combustion products and of the enthalpy of the combustible matter. The amount of the nitrogen oxides generated increases with increasing combustion temperature, chamber load, and flame turbulence. The NO formation in industrial combustion chambers can be abated by reducing the oxygen concentration, e.g., by two-stage combustion of natural gas; by reducing the combustion temperature, e.g., by flue gas recirculation, steam injection, or by the use of low air-excess coefficient; and especially by reducing the residence time of the stoichiometric mixture within the combustion chamber, which also reduces the amount of carbon monoxide, formaldehyde, and aromatic hydrocarbons generated. Activated carbon and silica gel are suitable for the adsorption of nitrogen oxides from flue gases.

58857

APTIC NO. 76612

Neely, W. C., A. D. West, and T. D. Hall

OZONE REMOVAL FROM ARC LAMP COOLING AIR. *J. Phys. E*, 8(7):543, July 1975. 6 refs.

An inexpensive, compact, and efficient catalytic converter for removal of ozone from the cooling air stream of compact arc lamps is described. Iron oxide is used as the catalyst. The device uses no power and requires no regeneration. The device was tested on the cooling air stream of a typical 150 W xenon arc lamp. The inlet air contained 1 to 1.5 times 10 to the -6 power ozone and after 30 min the exit air stream showed the minimum detectable amount of 10 to the -8 power. The exit air stream showed no ozone content after 50 to 60 min. The device was also tested with an ozone generator. The gas entering the catalytic chamber contained 2 to 3% ozone, while that leaving again showed essentially no ozone present. Apparently 30 to 40 min is necessary to achieve total ozone decomposition. However, acceptable (i.e., below toxic) levels were attained within 5 min. It was not possible to decrease this initial time lag by increasing the catalyst pathlength or by heating the catalyst. The total amount of ozone that passed through before the beginning of total decomposition was insignificant in these applications. This converter is quite practical for avoiding ozone emission by small arc lamps. (Author abstract modified)

58858

APTIC NO. 76099

Nekervis, W. F. and E. F. Hensley

CONCEPTUAL DESIGN OF A COMMERCIAL SCALE PLANT FOR CHEMICAL DESULFURIZATION OF COAL (FINAL REPORT). Dow Chemical Co., Midland, Mich., Michigan Div., Environmental Protection Agency Contract 68-02-1302, Program Element 1AB013, ROAP 21ADD-097, Rept. EPA-600/2-75-051, 625p., Sept. 1975. 37 refs.

A conceptual design and economic evaluation of a 9070 metric ton/day plant for the chemical removal of pyritic sulfur from coal are presented. The design is based on the removal of 95% of the pyritic sulfur from Lower Kittanning coal. The product coal is expected to meet present air quality regulations for fuel combustion operations. All supporting facilities are included for a self-sufficient operating complex with purchased water and power. Computer augmented studies are included for the material and energy balances, selection of the reactor systems, monitoring of operating parameters, and economic sensitivity studies of process alternatives. The capital and operating costs per ton of product coal are favorable with respect to other

CONTROL METHODS

58864

known processes for meeting air quality regulations when burning coals of comparable sulfur content. (Author abstract modified)

58859

APTIC NO. 82638

Nelken, H. H. and J. G. Altman

DESIGN CONSIDERATIONS FOR MODERN UTILITY BOILERS. Preprint, Foster Wheeler Energy Corp., Livingston, N. J., 9p., 1975. 7 refs. (Presented at the American Power Conference, 37th, Chicago, Ill., April 22, 1975.)

Design considerations for modern utility boilers are reviewed, with reference to the control of nitrogen oxide emissions from coal-fired units. Staged combustion appears to be the most effective method for controlling NOx emissions from coal-fired units since it is capable of suppressing both fuel and thermal NOx formation. Approximately 30-50% of the baseline NOx emissions can be eliminated with staged combustion is compared to 12-15% NOx reductions achievable with gas recirculation. Design considerations relating to the firing of refuse as supplementary fuel and to the burning of low Btu gas are also reviewed.

58860

APTIC NO. 82157

Nelson, Gerald Verdell and Glenn Cooper Wray

HYDROCRACKING PROCESS FOR CONVERTING HYDROCARBON INTO LOW SULFUR GASOLINE. (Texaco Inc., New York) U. S. Pat. 3,891,539. 11p., June 24, 1975. 11 refs. (Appl. Feb. 25, 1974, 13 claims).

An improved hydrocracking process for the conversion of heavy hydrocarbon oils having from 10-50% boiling components above 1000 F into a major fraction of low sulfur gasoline and a minor fraction of low sulfur residual fuel oil is described. The process involves hydrocracking the heavy oil with molecular hydrogen at a temperature of about 700-850 F in the presence of a sulfur and nitrogen resistant hydrocracking catalyst consisting of a hydrogenating component supported on an amorphous inorganic oxide cracking base. The heavy hydrocarbon oil is thus converted into a gas-oil fraction and a low sulfur residual fraction. The gas-oil fraction is separated from the residual fraction and is hydrocracked with molecular hydrogen at a temperature of 700-780 F in the presence of a sulfur and nitrogen resistant hydrocracking catalyst consisting of a hydrogenation component supported on a cation exchanged crystalline silica-alumina zeolitic molecular sieve cracking base. The end product is a low sulfur, low nitrogen gasoline. (Author abstract modified)

58861

APTIC NO. 83905

Nestaas, Ivar

IT IS POSSIBLE TO CONTROL MALODOROUS INDUSTRIAL EMISSION, BUT IT TAKES MORE THAN HIGH STACKS. (Plagsom industriell lukt kan fjernes, men det krever mer enn høye piper). Text in Norwegian. Tidsskr. Kjemi, Bergvesen, Met., 35(9):14-15, 17, Dec. 1975.

Methods available for the abatement of malodorous industrial emissions are reviewed. Malodorous waste gases from fish meal drying plants can be purified by condensation with water, e.g., sea-water. Adsorption on activated carbon silica gel or alumina is used mainly for the separation of solvents, e.g., trichloroethylene, and for cleaning waste gases from animal carcass processing plants. Incineration at a minimal temperature of 800 C is especially suitable for the deodorization of waste gases in cod liver oil extraction plants, coffee roasting plants, oil refineries, and in the petrochemical industry. Catalytic incineration, requiring a temperature of 400 C and a hold time of 0.02 sec, is suitable for waste gases that do not contain chlorinated hydrocarbons and solvents. Absorption of malodorous substances is possible with water to which certain reagents, e.g., sulfuric acid, sodium carbonate, sodium

hypochlorite, sodium hydroxide, or potassium permanganate are added.

58862

APTIC NO. 83914

Nesterov, P. M.

FLUE GAS CLEANING WITH ELEMENTAL SULFUR RECOVERY. (Issledovaniye protsessy oshistki gazov na primerye sposoba povucheniya elementarnoy siery). Text in Russian. Zh. Prikl. Khim., 48(10):2280-2282, Oct. 1975. 10 refs.

A flue-gas purification process resulting in recovery of elemental sulfur is described. A number of parameters determine optimal conditions for obtaining maximal output of the product with a minimal content of aggressive admixtures in the purified flue-gases. In the process of catalytic conversion with excess hydrogen sulfide, sulfur dioxide concentration was reduced proportionally to the square of the ratio. The result was a non-linear function between the parameters of flue gas purification and those of elementary sulfur recovery. For the determination of the conditions promoting better sulfur recovery and SO2 extraction from flue gas, an absorption process was employed in a 1-stage bubble apparatus. Water temperature was raised from 20 to 80 C, ethylene glycol from 40 to 120 C. The H2S and SO2 contents were determined iodometrically. The analysis of the results indicated the possibility of increasing purification of flue gases. At a 95% conversion of H2S in the basic process, losses ran to 0.1%. General sulfur output was higher than 99% with a content of less than 0.3% after combustion in the flue gases. For the extraction of H2S and SO2 from the flue emission by means of alkanolamines, purification rates of 96% for SO2 and of 90% for carbon dioxide were reached.

58863

APTIC NO. 84028

Nesterov, P. M.

MATHEMATICAL MODELING AND COMPUTATION OF THE TECHNOLOGICAL PARAMETERS OF FLUE GAS DESULFURIZATION BY THE CYCLIC AMMONIACAL METHOD. (Matematicheskoe modelirovaniye i raschet tekhnologicheskikh parametrov protsessy oshistki dymovykh gazov ot SO2 ammiachno-tsiklicheskim metodom). Text in Russian. Zh. Prikl. Khim., 48(11):2506-2514, Nov. 1975. 10 refs.

Mathematical modeling and computation of the technological and economic parameters of flue gas desulfurization at power plants and ore dressing plants by the cyclic ammoniacal method are presented. At sulfur dioxide concentrations of 0.25%, a purification efficiency of 85% can be achieved. The regeneration of the saturated ammoniacal solution is done in a split flow system. The steam consumption for the regeneration can be reduced considerably by the addition of ammonium disulfite. The cyclic ammoniacal absorption method with split-flow regeneration is especially suitable for power plants and ore dressing plants emitting flue gases with high SO2 concentrations.

58864

APTIC NO. 83385

Newman, Jacques

PROCESS FOR REMOVING SULFUR DIOXIDE FROM GASES. (Thermotics, Inc., Houston, Tex.) U. S. Pat. 3,896,214. 6p., July 22, 1975. 4 refs. (Appl. Sept. 5, 1972, 8 claims).

A scrubbing process for removing sulfur dioxide from gases is described in which the sulfur oxides are contacted with a hydroxide solution. The products formed by the reaction are water and certain soluble salts. These salts are routed to the treatment system where they contact anion exchange resins in the free hydroxyl form (ROH). The hydroxide solution is reproduced and recycled to be used again in the scrubbing system. The spent exchange resins are routed to the regeneration system where they are contacted with another hydroxide solution, preferably a hydroxide having a cation which com-

biners with sulfite or sulfate to form a product substantially insoluble in water. The regenerated resins (ROH) are then recycled to be used again in the treatment system. The regeneration reaction product is dewatered and disposed of as a solid waste. This process is better than direct scrubbing with a lime hydrate solution, because of the problems of equipment scaling and plugging caused by high concentrations of calcium salts. (Author summary modified)

58865

APTIC NO. 76116

Nichols, Grady B. and Joseph D. McCain

PARTICULATE COLLECTION EFFICIENCY MEASUREMENTS ON THREE ELECTROSTATIC PRECIPITATORS (FINAL REPORT). M. W. Kellogg Co., Houston, Tex., Environmental Protection Agency Contract 68-02-1308, Program Element IAB012, ROAP 21ADL-004, Task 21, Rept. EPA-600/2-75-056, SORI-EAS-75-428(3296-II), 83p., Oct. 1975. 4 refs.

The fractional efficiencies and operating characteristics of three full-scale electrostatic precipitators were investigated. The plants selected for the tests included two power generating stations and a cement manufacturing plant. At one power station, the precipitator was located downstream from the air preheater (cold side), while the other power station installation was of the hot side type. Field measurements of total inlet and outlet mass concentrations, particle size distributions, and electrical data were used to compare the measured performance of these precipitators with theoretically predicted efficiencies computed with a mathematical model. Theoretical and measured efficiencies showed reasonable agreement, except for the hot side installation where overall mass efficiency measurements were considerably lower than the theoretical predictions. Fractional efficiency curves are illustrated for each installation.

58866

APTIC NO. 83384

Niessen, Walter R. and Elbridge M. Smith

FLUE GAS DESULFURIZATION -- FACTS AND SPECULATION. *Iron Steel Engr.*, 52(4):67-71, April 1975.

Flue gas desulfurization (FGD) technology emerged as a result of national concern over sulfur dioxide pollution. Historical perspectives in flue gas desulfurization are discussed. Over 100 FGD processes are now in some stage of development. A difference in the proposed flue gas contactor is the only variant among a group of process concepts in many cases. Results of experiments with lime and limestone dry contacting throwaway processes have generally been disappointing. Wet contact throwaway processes, including lime or limestone scrubbing and double alkali processes, have been more successful. Disposal of waste solids is a substantial environmental problem associated with all of the throwaway processes. Recovery processes are also discussed, including alkaline absorption-dry contacting, alkaline absorption-wet contacting, carbon adsorption, and direct conversion. Although flue gas desulfurization may be an accomplished fact and an available technology, it is not reasonable to expect it will come without a substantial cost which, at present flue values, generally exceeds the differential between high and low-sulfur fuels. Only in a few cases can flue gas desulfurization improve upon the purchase of low-sulfur fuels for the industrial boiler. Interest and activity in testing FGD is expected to continue, however, as the nation strives to balance its increasing demand for energy with its desire for enhanced air quality. (Author abstract modified)

58867

APTIC NO. 79780

Ninomiya, N. and H. Nishino

SIMULTANEOUS DENITRIFICATION AND DESULFURIZATION TREATMENT BY ACTIVATED CARBON CATALYST. (*Kasseitan shokubai ni yoru dassho, datsuryu doji shori*). Text in Japanese. Kankyo Sozo (*Environ. Creation*), 5(9):59-64, Sept. 1975. 20 refs.

AIR POLLUTION ABSTRACTS, JUNE 1976

The theoretical basis for denitrification using activated carbon, including the adsorption mechanism of nitrogen oxides by activated carbon, the desorption mechanism of NOx by washing with water or heating, the oxidation of nitric oxide by activated carbon, the reduction of nitric oxide by activated carbon, and the simultaneous treatment of NOx and sulfur oxides are reviewed with experimental data. A simultaneous NOx and SOx treatment method by catalytic ammonia reduction of NOx and oxidation adsorption of SOx using an activated carbon catalyst was developed. Test data on the denitrification rate (above 95%), the desulfurization rate (above 90%), and the effects of reaction temperature and space velocity on the efficiency obtained using a model gas of known composition and a boiler flue gas are also given.

58868

APTIC NO. 84109

Nishimoto, Yoshihiko, Naoyuki Takahashi, and Kenji Inoue

PURIFICATION METHOD OF PLANT WASTE GAS CONTAINING SULFUR OXIDES AND METALLIC DUST. (*Sanka io gasu to kinzoku dasuto o ganyu suru kojo haigas no juoka hoho*). Text in Japanese. (Mitsubishi Heavy Industries Ltd. (Japan)) Japan. Pat. Sho 50-33038. 4p., Oct. 27, 1975. (Appl. June 5, 1968, 1 claim).

A purification method for waste gas containing sulfur oxides and metal dust exhausted from the converters and furnaces of non-ferrous metal refineries is described. Sulfur dioxide, sulfuric anhydride, dust, and soot contribute greatly to air pollution. Metal dust contained in the exhaust gas from copper and zinc refineries is too fine to be completely collected by ordinary wet type or electrostatic dust collectors. Sulfur dioxide exhausted from converters is diluted and released into the air because it is too poorly concentrated to be economically recycled as a raw material for sulfur manufacture. The new process presents an improved alkali aqueous solution washing method that solves these problems. This method separates copper, iron, lead and arsenic as precipitates from the waste gas and recovers sulfuric salt of high purity. The process consists of moisturizing cooling equipment, absorption equipment, an absorber preparation tank, dust separation equipment, an oxidation column, a copper recovery tank, a hydroxide removing tank, and crystallizing equipment.

58869

APTIC NO. 83401

Nishinomiya, Torazo, Norishige Ohyama, Atsumi Watabe, and Takashi Asakawa

CHOKE VALVE CONTROLLING DEVICE. (*Chokuben no saiteki kaido seigyosochi*). Text in Japanese. (Hitachi, Ltd. (Japan)) Japan. Pat. Sho 50-30764. 8p., Oct. 3, 1975. (Appl. May 31, 1971, 1 claim).

A digital automobile engine carburetor choke valve controlling device is described. It provides the most efficient angle for the butterfly (choke) valve, especially during low temperature starting and idling, and reduces the emission of carbon monoxide and hydrocarbons during these periods of operation. The process consists of a digital detecting system for measuring the rotational speed of the engine, which activates the movement of the butterfly valve to the angle best suited to the speed of engine rotation. With this electronically controlled auto choke, the engine will smoothly rotate at the minimum allowable air/fuel ratio, which greatly reduces the emission of noxious gas during idling. This system uses little energy and has a permanent service life with an accuracy which is never marred by vibration or impact.

58870

APTIC NO. 83490

Nishizawa, Toshio, Akira Tokumaru, Yoshiki Komiyama, and Yoshihiro Watanabe

FUEL COMPOUNDS OF HIGH-OCTANE VALUE AND POLLUTION PREVENTION. (*Kookutanka, osenboshi nenryo soseibutsu*). Text in Japanese. (Sumitomo Chemical Co., Ltd. (Japan)) Japan. Pat. Sho 50-35524. 5p., Nov. 17, 1975. (Appl. July 4, 1972, 2 claims).

A process related to the composition of high-octane fuel for pollution prevention is described. Internal combustion engines contribute greatly to air pollution and one of the pollutants in the exhaust gas is lead alk which is used to increase the octane rating of gasoline. The lead compounds in gasoline damage catalysts in the emission gas control devices that remove carbon monoxide and nitrogen oxide. The new process presents a high octane fuel for prevention of pollution using a typical gasoline hydrocarbon as the base, tertiary butyl methyl ether (TBME), a formal and/or a specific alcohol. This fuel greatly reduces the carbon monoxide in exhaust gas and generates very little nitrogen oxides. Basic gasoline hydrocarbons may contain small amounts of lead. It is preferable to have more saturated hydrocarbons in gasoline than olefin group or aromatic hydrocarbons. The octane value of the fuel increases in relation to its TBME content; however, 2-30 wt% of TBME, 0.1-10 wt% of formal, and 0.1-10 wt% of alcohol are adequate for the fuel.

58871

APTIC NO. 82125

Nohira, Hidetaka

DEVICE FOR CONTROLLING THE RECYCLE OF EXHAUST GAS IN AN INTERNAL COMBUSTION ENGINE. (Toyota Jidosha Kogyo Kabushiki Kaisha, Toyota (Japan)) U. S. Pat. 3,915,133. 4p., Oct. 28, 1975. 12 refs. (Appl. Feb. 22, 1974, 2 claims).

An exhaust gas recirculation system for reducing nitrogen oxide emissions from internal combustion engines is described which provides for stopping the recycling of exhaust gas when there is a danger of possible freezing of the water content in the exhaust gas due to low temperatures around the throttle valve of the carburetor. The system includes a conduit for recycling exhaust gas from the exhaust pipe to the upstream side of the carburetor throttle valve, a temperature sensor in the carburetor, a controller that receives a signal from the temperature sensor, and an electro-magnetic transfer valve that is responsive to the signal from the controller for stopping the flow of recycled exhaust when there is a danger of freezing.

58872

APTIC NO. 82522

Nohira, Hidetaka and Shin Ito

CONTROL SYSTEM FOR MOTOR VEHICLE WITH CATALYTIC CONVERTOR AND AUTOMATIC POWER TRANSMISSION MECHANISM. (Toyota Jidosha Kogyo Kabushiki, Kaisha (Japan)) U. S. Pat. 3,895,541. 11p., July 22, 1975. 8 refs. (Appl. June 15, 1973, 7 claims).

An air pollution control system is provided for a motor vehicle which includes a catalytic convertor for purifying engine exhaust gases and an automatic power transmission mechanism controlled by an oil pressure system. The control system operates in conjunction with the oil pressure control system of the automatic transmission to sense engine exhaust gas temperature and to delay upshift of the automatic transmission until a desired temperature of the engine exhaust gases is achieved. In other systems, difficulty is encountered in a motor vehicle provided with an automatic power transmission mechanism because shifting between its driving speed ratios is automatically controlled irrespective of the exhaust gas temperature. This system overcomes these problems. (Author abstract modified)

58873

APTIC NO. 82889

Nohira, Hidetaka and Kiyoshi Kobashi

EXHAUST GAS RECIRCULATION SYSTEM. (Toyota Jidosha Kogyo Kabushiki Kaisha, Toyota (Japan)) U. S. Pat. 3,881,456. 7p., May 6, 1975. 5 refs. (Appl. May 29, 1974, 4 claims).

An exhaust gas recirculation system for purifying exhaust gas released from engines is described. The pressure of exhaust gas recirculated from the exhaust system into the intake system is maintained substantially equal to atmospheric pres-

sure. The valve for controlling the exhaust gas recirculation rate performs its opening and closing operations positively and reliably. In conventional systems, it is impossible to perfectly close the control valve because the engine speed is low in the running condition where perfect shut-off of exhaust gas recirculation is desired, as during cranking or idling, and also because air pump pressure is weak. (Author summary modified)

58874

APTIC NO. 82931

Nohira, Hidetaka and Kiyoshi Kobashi

EXHAUST GAS RECIRCULATION SYSTEM. (Toyo Jidosha Kogyo Kabushiki Kaisha, Toyota (Japan)) U. S. Pat. 3,877,452. 8p., April 15, 1975. 3 refs. (Appl. March 28, 1974, 3 claims).

An exhaust gas recirculations system is described which features an arrangement by which the exhaust gas flow rate control valve is operated by positive pressure. A diaphragm chamber is adapted for controlling the flow rate control valve and arranged to be selectively connected to the suction system and to a pressure amplifier through a pressure change-over valve. An air bleeding mechanism is located in the pressure amplifier for converting negative pressure variation in the suction system into amplified positive pressure variation. Conventional systems use negative pressure to open the control valve. A negative pressure storage tank is needed for constantly obtaining negative pressure signal by amplifying the venturi negative pressure. This creates problems of air leakage and storage capacity. (Author abstract modified)

58875

APTIC NO. 83020

Noll, K. E., W. T. Davis, G. W. Kelley, and H. E. Harper

STUDY OF FIBERGLASS FABRICS FOR THE COLLECTION OF FLYASH. Preprint, Tennessee Univ., Knoxville, Dept. of Civil Engineering and Carborundum Co., Knoxville, Tenn., Pollution Control Div., 36p., June 1975. 17 refs.

Existing fabric filter installations on oil- and coal-fired boilers are reviewed along with laboratory and pilot experiments on the filtration of fly ash by fiberglass fabrics. Fly ash filtration appears to be technically feasible, with fabric selection being one of the critical design elements. The most prevalent problems associated with fabric filter installations on boilers are acid attack and temperature damage to the filter media. These problems can be reduced by the use of limestone or dolomite addition to the furnace and/or effluent to reduce the acid dew point and the selection of high temperature fabrics such as fiberglass with abrasion- and acid-resistant protective finishes. Existing fabric filter collectors on boilers demonstrate fabric pressure losses ranging from 2.6-6.0 in. of water, and filtration efficiencies of 99.0-99.9%. (Author conclusions modified)

58876

APTIC NO. 82892

Nomura, Tsutomu and Masakazu Sakai

ELECTRIC DUST COLLECTOR. (Sumitomo Shipbuilding and Machinery Co., Ltd., Tokyo (Japan)) U. S. Pat. 3,877,898. 5p., April 15, 1975. 23 refs. (Appl. Sept. 5, 1973, 3 claims).

An electrostatic precipitator that is located directly on the roof or top of a factory building is described. It is light-weight because the dust collecting electrodes are made with lightweight materials such as polyvinyl chloride, fiber reinforced plastics, synthetic resin that is aluminum treated to resist corrosion, duralmin, or light metals. Conventional precipitators are made from iron and are too heavy to mount on buildings. (Author abstract modified)

58877

APTIC NO. 83761

Nostitz-Wallwitz, R. von

THE DRYING MACHINE - REGULATORY AND SUPERVISORY ASPECTS. (Die Trockenmaschine - Regelungs-

und ueberwachungstechnische Aspekte). Text in German. *Strassen Tiefbau*, 29(12):37-39, 1975.

The conditions necessary for effective operation of asphalt-aggregate drying equipment are reviewed. These include the weighing and mixing of the materials, filtering of gases from the drying operation, and return of collected dust to the process. Present practice is to use 30-40% excess air in the burners, and to maintain temperatures of approximately 120-180 C in the drying oven and 120 C at the filters. In large installations the carbon monoxide and carbon dioxide content of exhaust gases are monitored in order to detect failure of burners or air supply.

58878

APTIC NO. 79709

Nottrodt, Adolf

HIGH TEMPERATURE PYROLYSIS - PROCESS ANDCO-TORRAX - AS EXEMPLIFIED IN LUXEMBOURG. (Hochtemperatur-Pyrolyse-Verfahren Andco-Torrax - am Planungsbeispiel Luxembourg). Text in German. *Muell Abfall*, 7(5):132-133, 1975.

The Andco-Torrax high-temperature pyrolysis process is described in connection with plans for such a trash pyrolysis unit to be built in Luxembourg. The trash is charged in at the top of a vertical gas generator. After drying and pyrolysis, the pyrolytic coke is oxidized to carbon monoxide with preheated air, and the slag is melted at 1650 C in the bottom section. The pyrolysis gas stripped off the gas generator at 400-500 C has a calorific value between 800 and 1400 C, and contains carbon monoxide, hydrogen, and hydrocarbons. It is mixed with air and combusted in a gas burning chamber between 1200 and 1400 C, during which process the dust entrained is melted. Part of the hot flue gases are used to preheat the air for the gas generator, while 80% are used in a steam boiler for electricity generation. After dedusting in an electrostatic precipitator, the flue gases are discharged into the atmosphere.

58879

APTIC NO. 80356

Novikov, A. I., A. N. Skvortsov, and V. A. Kishkarev

CONICAL SCRUBBERS WITH FLUIDIZED SPHERICAL PACKING FOR GAS PURIFICATION. *Intern. Chem. Eng.*, 15(3):530-533, July 1975. 4 refs.

The characteristics and applications of conical scrubbers with fluidized spherical packing (CSS) in spraying and ejection variations are discussed. The packing is fluidized most intensively near the lower base of the cone, and gradually slows down along the height. The upper, slightly mobile layers of spheres serve to partially recover the spray which is formed in large amounts near the lower base of the cone. Upper grids with a layer of spheres having a height of 150 mm are provided for more complete recovery of the spray in the cylindrical part of the units. These grids do not become clogged with residue and have practically no effect on the overall resistance of the scrubber. For spheres of silicon tetrafluoride, hydrogen fluoride, and dust with a diameter of 34-40 mm, the maximum recovery capacity is achieved with a static bed height of HO equals 500-800 mm.

58880

APTIC NO. 82050

Numagami, Kiyoshi, Toshiki Okuyama, and Tadanari Kato

CATALYST FOR PROMOTING REDUCTION OF NITROGEN OXIDES CONTAINED IN EXHAUST GASES. (Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,909,456. 7p., Sept. 30, 1975. 10 refs. (Appl. April 12, 1973, 5 claims).

A catalyst for promoting reduction of nitrogen oxides contained in exhaust gases is described. It primarily consists of a carrier and 0.02 to 0.85 wt% of ruthenium. The catalyst may also contain platinum, rhodium, and/or palladium. The catalyst is obtained by immersing the carrier in an aqueous solution containing a catalytic component or components, and calcining the same in a flow of hydrogen gas at 300 to 1000 C. Unlike other catalysts, this catalyst has high low-temperature per-

AIR POLLUTION ABSTRACTS, JUNE 1976

formance, high mechanical strength and low resistance to the flow of exhaust gases which are passed through the catalyst. (Author abstract modified)

58881

APTIC NO. 83577

Nutter, Dale E.

CENTRIFUGAL APPARATUS FOR SEPARATING EN-TRAINED LIQUIDS FROM A GASEOUS STREAM. (Heat/Fluid Engineering Corp., Tulsa, Okla.) U. S. Pat. 3,885,935. 7p., May 27, 1975. 8 refs. (Appl. June 19, 1973, 13 claims).

A centrifugal apparatus for separating entrained liquids from a gaseous stream is described. Entrained liquids pass through a tuyere provided with a plurality of symmetrical inclined blades extending from the center radially outwardly. Each blade has a leading edge, a trailing edge, and upstream and downstream faces which are inclined with respect to the central longitudinal axis of the tuyere and to planes perpendicular thereto. The blades are arranged so that their axial projections overlap, whereby there is no open area extending parallel to the longitudinal axis of the tuyere. The gas from an inlet pipe passes through the tuyere where it is given a rapid helical motion. Droplets entrained in the gaseous stream adhere to the tuyere surfaces or are driven outwardly by centrifugal force onto a cylindrical wall which they follow to a liquid collection and drainage area. The cleaned, whirling gas is removed through an outlet pipe which is downstream of and axially aligned with the tuyere. In comparison to other devices, this device reduces the amount of liquid reentrained into the gaseous stream from the tuyere and prevents the flow of liquid into the gas outlet pipe from its exterior surface.

58882

APTIC NO. 82060

O Hara, Mark J.

DESULFURIZATION PROCESS START-UP METHOD. (Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,909,396. 4p., Sept. 30, 1975. 3 refs. (Appl. Oct. 20, 1972, 5 claims).

A method for the start up of a process for desulfurizing a hydrocarbonaceous charge stock is described. It is especially adaptable to those processes which effect the desulfurization of asphaltene-containing hydrocarbonaceous black oils. Adsorbed water exhibits a deactivating effect upon catalytic composites utilized for the hydrogenative desulfurization of hydrocarbonaceous charge stocks. Such composites, generally comprising an alumina-silica carrier material are dried, prior to contacting the charge stock, by a method which does not of itself induce deleterious effects respecting either catalyst activity, or stability. This is an improvement over other processes. Drying is effective in a non-reducing atmosphere at static conditions. (Author abstract modified)

58883

APTIC NO. 82765

O'Neill, E. P., D. L. Keairns, and W. F. Kittle

A THERMOGRAVIMETRIC STUDY OF THE SULFATION OF LIMESTONE AND DOLOMITE - THE EFFECT OF CALCINATION CONDITIONS. Preprint, North American Thermal Analysis Society, 27p., 1975. 19 refs. (Presented at the North American Thermal Analysis Society Meeting, 5th, Peterborough, Canada, June 8-12, 1975.)

The isothermal reaction of sulfur dioxide with limestone and dolomite was studied in a pressurized thermogravimetric analysis system at pressures ranging from 1-10 atmospheres and temperatures from 750-1050 C to obtain information on the use of fluidized bed combustion for reducing SO₂ pollution from coal combustion. Both sample size and gas flow rate strongly influenced the observed kinetics. However, the dominant influence on the sulfation reaction of calcined sorbents was the carbon dioxide pressure in which the stone was originally calcined. A high partial pressure of CO₂ during calcination of limestone and dolomite increased the sorbent capacity in sulfa-

CONTROL METHODS

tion. Since high partial pressures of CO₂ are generated in the fluidized bed combustion of fossil fuels, sorbent utilization is expected to be enhanced by pressurized operation. The increase in partial pressure of SO₂ caused by system pressurization leads to modest increases in reaction rate during most (about four-fifths) of the sulfation reaction. (Author abstract modified)

58884

APTIC NO. 76555

Obara, Okitsugu and Tadaaki Abe

THE DEVELOPMENT OF ANTI-POLLUTION BURNERS. (Kogaitaisaku bana no kaihatsu). Text in Japanese. Ebara Jiho (Ebara Times), no. 93:73-78, 1975. 2 refs.

Nitrogen oxide emissions from the KDA Model 6 water tube boiler (steam output 6 tons/hr) were investigated to obtain information for the development of nitrogen oxides emission control methods. Data on the relationships between NO_x emission and boiler capacity, boiler load and effects of steam capacity, thermal load in the combustion chamber, the type of fuel and air-fuel ratio, and the effect of steam injection on NO_x reduction were investigated. The NO_x reduction rates obtained were 38-60% for kerosene, 34-50% for heavy oil A, and 18-20% for heavy oil B. The NO_x reduction rate by gas combustion tested by the combined gas cooler and heater unit Model 16 JR 018 was 52%. Two types of low NO_x burners were developed and tested for NO_x reduction efficiency. The reduction rate was 20%.

58885

APTIC NO. 82719

Oberdorfer, Paul E.

FUEL CONSUMPTION AND EMISSION REDUCTION TUNE-UP. Preprint, Sun Oil Co., Marcus Hook, Pa., Automotive Lab., 29p., 1975. 4 refs. (Presented at the North American Motor Vehicle Emissions Control Conference, Annual, 4th, Anaheim, Calif., Nov. 5, 1975.)

The effects of a diagnostic and tune-up procedure on fuel consumption and exhaust emissions from a random sample of 1965-1973 model year cars are reported. The diagnostic procedure involved the use of electronic diagnostic and exhaust emission analysis equipment. The procedure resulted in an average fuel economy improvement of over 13% which amounts to a near term potential for gasoline savings of approximately 750,000 barrels/day on a national basis. Hydrocarbon and carbon monoxide emissions during idle and at 2500 rpm were reduced by a factor of 1.5-2.0.

58886

APTIC NO. 80025

Obr, Josef

AIR POLLUTION BY DUST IN THE BUILDING INDUSTRY IN CZECHOSLOVAKIA. STATE OF THE ART AND POSSIBLE SOLUTIONS DURING THE 6-TH 5-YEAR-PLAN. (Prasnost v odvetvi vyroby staviv v stavebnictvi CSR. Soucasny stav a zpusob reseni v odobi seste petiletky). Text in Czech. Stavivo, 53(1):7-10, Jan. 1975.

The emission of solid pollutants by the building materials industry of Czechoslovakia is distributed as follows: 69% by cement and lime factories, 13.5% by ceramic and glass works, 8.5% by brick factories. A successful technical solution for dust and removal has been achieved only in the case of rotary cement ovens. As an example, the application of electrostatic dust removers at the Kralodvorske cement works resulted in decreasing the emission to 6 kg/hr, from about 150 kg/hr in 1973. The cyclone filter of the type BMM, with imported sand filters, is promising and is now being tested for application at cement coolers at several installations. The same type of filter can also be used for dust removal at lime rotary ovens. It is planned to decrease the total emission of solid particles by 72% in the year 1980, relative to 1970. For this purpose a budgetary sum of 417 million Kc (\$28,000,000) has been designated for the years 1976-1980.

58889

APTIC NO. 84153

58887

Oestreich, H.

GUIDING WALLS AND INSTALLATIONS CREATING TURBULENCE IN COMBUSTION CHAMBERS OF COAL-FIRED STEAM GENERATORS. (Lenkwaende und Wirbelembauten in Feuerraumen von kohlegefeuerten Dampferzeugern). Text in German. Brennstoff-Waerme-Kraft, 27(9):345-348, 1975. 1 ref.

Experience with baffles or baffle plates in coal-burning steam generators is presented. Their installation with carbon dioxide content increased by 1-1/2%. The efficiency of these boilers could be increased from 20-50%. The baffles led to a better mixture of the smoke gases with varying oxygen content before entering the contact heating surface thereby shortening flame length and raising combustion temperature. These facts affected coal supply with a high proportion of volatile components and inferior fuels. The working periods of coal-fired steam generators could be lengthened. Pollution occurred more in the furnace space. Heating surfaces were in part made self-cleansing. Dirt deposit in the ancillary heating surfaces decreased and the hazard of the primary contact heating surfaces being sintered was prevented. Baffle installation was particularly simple in La Mont-boilers where downward-directed baffles producing turbulence were beneficial. Contracted boiler space was useful insofar as secondary air injection was more successful because of its deeper penetration.

APTIC NO. 76508

58888

Ogawa, Hiromasa and Hiroshi Sano

MANUFACTURING METHOD OF ACTIVATED CARBON FOR DESULFURIZATION BY ALCOHOL-DENATURED AMINOTRIAZINE RESIN TREATMENT. (Arukuru hensei aminotoriajin jushi shori ni yoru datsuryuyo kasseitan no seizoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-21437. 2p., July 23, 1975. (Appl. Dec. 9, 1971, 1 claim).

A preparation method for activated carbon with a high absorption efficiency for sulfur dioxide gas is described. The impregnation of alcohol-reacted aminotriazine resins into activated carbon increased the SO₂ absorption, because of the higher nitrogen content in the carbon. The stable impregnation can be made using alcohol-reacted aminotriazine resins, and the alcohol can be methanol, ethanol, n-propanol, n-butanol, iso-propanol, or iso-butanol. Carbon was soaked in a 5 to 25% alcohol-reacted aminotriazine solution, dried, and then heated at 750 to 950 C for 10 min without air supply. The increased wt% of the nitrogen component in the activated carbon was 2.3%, 2.5%, 2.1%, and 2.2% for the hexa-methoxy methyl melamine, ethanol-reacted melamine resin, butanol-reacted melamine resin, and butanol-reacted benzoguanamine resin-impregnated carbons, respectively. Their corresponding SO₂ absorptivities in a 0.2% SO₂ gas absorption test were 75%, 85%, 64%, and 73%, respectively. These values can be compared with the 48% SO₂ absorptivity of non-impregnated activated carbon.

APTIC NO. 82688

58889

Ohtani, Junji, Akira Ohkubo, and Sakuji Arai

IDLING CONTROL DEVICE OF INTERNAL COMBUSTION ENGINE. (Nainen kikan no aidoringu unten-seigyo sochi). Text in Japanese. (Honda Motor Co. Ltd. (Japan)) Japan. Pat. Sho 50-25971. 2p., Aug. 28, 1975. (Appl. Feb. 26, 1972, 1 claim).

A idling control device for automobile internal combustion engines is described, which will interrupt the fuel supply from the carburetor to the combustion chamber during idling. Conventional combustion engines with its primary and secondary combustion chambers can save fuel and are effective for prevention of pollution. However, during idling, combustion in the primary chamber is often extinguished due to the extremely low concentration of the fuel/air mixture provided to the

primary combustion chamber. The new process makes use of this disadvantage by presenting an idling control which consists of the installation of a selective venturi type carburetor connecting to the primary combustion chamber and an installation of a carburetor connecting to the secondary combustion chamber. The selective venturi carburetor will stop the supply of fuel to the primary combustion chamber during idling of the engine. A small amount of the highly concentrated fuel/air mixture from the secondary combustion chamber remains in the top portion of the primary chamber. The rest of the chamber is occupied by aspirated air containing no fuel; therefore, it will not emit any uncombusted substances during the idling mode.

58890

APTIC NO. 80110

Ohya, K.

PRESENT SITUATION OF OFFENSIVE ODOR CONTROL TECHNOLOGY IN MARINE PRODUCTS PROCESS. (Suisanbutsu kako ni okeru akushu boshi gijutsu no jissai). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(10):73-78, 1975.

Malodor problems at a fish meal plant and its control measures are reviewed. Descriptions of production processes of fish meal and malodor emission sources are given. Control measures by production process modification and equipment modification are discussed. Descriptions of a deodorization system consisting of a water scrubbing tower, where water soluble ammonia, hydrogen sulfide, and trimethylamine are removed with 80-90% removal rate, and a combustion deodorization system, where malodorous compounds are decomposed by oxidation are given with some investigation data. A description of a combustion deodorization system is given with its merits and demerits. The running cost of deodorization is also discussed.

58891

APTIC NO. 82324

Diestad, Andrew

INERT GAS SYSTEM AND METHOD FOR TANKERS. (Tank Sapp (UK) Ltd., Croydon (Great Britain)) U. S. Pat. 3,899,099. 4p., Aug. 12, 1975. 4 refs. (Appl. June 21, 1973, 5 claims).

A method and system for providing inert gas to prevent fires and explosions aboard tankers are described. A portion of the flue gas from the ship's boiler is scrubbed with sea water to remove sulfur dioxide. The scrubbed flue gas is used as an inert gas blanket for the cargo tanks. The blanket of inert gas contains less than 12% oxygen and combustion is prevented. For purposes of improved operation and ecology, the SO₂ contained in the sea water is stripped from it before the sea water is discharged back into the sea. (Author abstract modified)

58892

APTIC NO. 82210

Okamoto, Hiroshi, Takao Kitano, Fumio Tanimoto, Yuichi Oda, and Keishin Shigeta

MANUFACTURING METHOD OF PARTICULATE TYPE CALCIUM SULFITE COMPOSITION. (Biryushijyo arysuan karushumu soseibutsu no seizoho). Text in Japanese. (Hiroshima Gas Co., Ltd. (Japan)) Japan. Pat. Sho 50-33987. 6p., Nov. 5, 1975. (Appl. July 27, 1971, 1 claim).

A manufacturing method for particulate calcium sulfite is described. Sulfur dioxide contained in exhaust gas; dust and soot; and the shells of oysters are used. The products recovered will supply a particulate alkaline earth metal salt which has value as a filler and compounding material in the paper, plastic, building material, and paint industries. The process has the following steps: preparation of an aqueous solution with 15-50 wt% of aliphatic acid (1-4 carbon), addition of oyster shells to the solution and removal of unresolved substances, addition of gas containing sulfur dioxide to the solution at a reaction temperature of 0-80 C, and separation, deox-

AIR POLLUTION ABSTRACTS, JUNE 1976

idizing and dehydration of the reaction products that settle out of the solution.

58893

APTIC NO. 82051

Okitsu, Kingo and Masashi Shimonaka

EXHAUST GAS PURIFYING THERMAL REACTOR. (Toyo Kogyo Co., Ltd. (Japan)) U. S. Pat. 3,914,936. 6p., Oct. 28, 1975. 5 refs. (Appl. April 3, 1974, 4 claims).

A thermal reactor for purifying exhaust gas emitted from an internal combustion engine is described. It is a three chamber type which has an inner shell forming a primary reaction chamber, an intermediate shell surrounding the inner shell with a secondary reaction chamber formed there between, and an outer shell surrounding the intermediate shell with an adiabatic space formed between it and the intermediate shell. These shells are supported in position by separate supporting strips respectively connecting the inner shell to the intermediate shell within the secondary reaction chamber and the intermediate shell to the outer shell. These connections are made by using a fillet welding method. The construction provides a substantial improvement in durability and service over other three chamber type thermal reactors. (Author abstract)

58894

APTIC NO. 82850

Oklejas, Robert A. and Eli Oklejas, Jr.

GAS REGENERATION TESLA-TYPE TURBINE. (Assignee not given.) U. S. Pat. 3,899,875. 8p., Aug. 19, 1975. 5 refs. (Appl. Jan. 16, 1974, 13 claims).

An apparatus which utilizes heat exchange in a Tesla-type turbine to increase nozzle output temperature, system power output, and system efficiency is described. The apparatus includes an external regenerator and a second regeneration system among the turbine blades themselves. The system facilitates the attainment of very high intake air temperatures at the entrance to the combustion chamber while providing a means for cooling the turbine blades. The cooling of the outer peripheral area of the blades raises the maximum permissible working gas temperature at the nozzle by protecting the blades from adverse effects of high temperature such as melting. With higher gas temperatures at the nozzles, greater power output and efficiency of the turbine is achieved. With the regenerator parameters properly designed and adjusted, cooling of the turbine blades can be accomplished without appreciable cooling of the working gas exiting the nozzles. (Author summary modified)

58895

APTIC NO. 82387

Oleck, Stephen M., Thomas R. Stein, Howard S. Sherry, and Donald Milstein

PROCESS FOR DEMETALIZING AND DESULFURIZING RESIDUAL OIL WITH HYDROGEN AND ALUMINA-SUPPORTED CATALYST. (Mobil Oil Corp., New York) U. S. Pat. 3,891,541. 11p., June 24, 1975. 6 refs. (Appl. Aug. 29, 1973, 7 claims).

A process for the demetalization and desulfurization of residual oil is described. The oil is contacted with hydrogen in the presence of a catalyst consisting of oxides or sulfides of a Group VIB metal and an iron group metal on an alumina support under the following hydroprocessing conditions: a hydrogen pressure of about 500-3000 psig, a hydrogen circulation rate of about 1000-15,000 standard cu ft/barrel of feed, a temperature of about 600-850 F, and space velocity of 0.1-5.0 LHSV. The catalyst's surface area is between 40 and 70 sq m/g, and not less than 55-70% of its pore volume consists of pores having a diameter range of about 180-300 Å.

58896

APTIC NO. 82065

Oliver, Roger Geoffrey

CATALYTIC PROCESS. (Imperial Chemical Industries, Ltd., London (Great Britain)) U. S. Pat. 3,915,896. 7p., Oct. 28, 1975. 2 refs. (Appl. Aug. 9, 1973, 13 claims).

CONTROL METHODS

58903

A catalyst for exhaust gas treatment under oxidative or reductive conditions was developed. It is supported on a refractory compound such as gehlenite in which a basic oxide is in combination with an acidic or amphoteric oxide. The active constituent of the catalyst is one or more platinum group metals. The life of this catalyst is longer than other Pt catalysts. (Author abstract modified)

58897

APTIC NO. 82205

Omori, Norio and Katsuhiko Oiwa

ELECTRONICALLY CONTROLLED FUEL INJECTION SYSTEM. (Nippondenso Co., Ltd., Kariya (Japan)) U. S. Pat. 3,910,240. 10p., Oct. 7, 1975. 3 refs. (Appl. Sept. 28, 1973, 4 claims).

An electronically controlled fuel injection system for a multicylinder internal combustion engine is described. The injection valves and the exhaust pipes are divided into two groups, and an oxygen concentration detector is provided in the exhaust pipe in one of the two groups. A voltage generated by the detector in accordance with the oxygen concentration is applied to an electronic control unit to control the electric pulse for the injection valve in the group corresponding to the exhaust pipe with the detector. The electric pulses supplied to the injection valves in the other group correspond to an operating parameter of the engine. (Author abstract modified)

58898

APTIC NO. 82377

Omori, Norio and Katsuhiko Oiwa

FUEL INJECTION PUMP FOR AN INTERNAL COMBUSTION ENGINE. (Nippondenso Co., Ltd., Kariya (Japan)) U. S. Pat. 3,896,779. 5p., July 29, 1975. 10 refs. (Appl. March 20, 1973, 2 claims).

A fuel injection pump for diesel internal combustion engines is described that reduces the amount of exhaust odor generated during idling as a result of insufficient combustion chamber temperature. An electromagnetic valve in a passage leading to an intake or an outlet port of the pump is provided along with a controller connected to the valve for adjusting the opening time of the valve. The pump supplies enough fuel into certain cylinders while stopping the fuel supply to the other cylinders when the engine is in idling operation to raise the temperature in the combustion chamber to a level that favors the reduction of exhaust odors. (Author summary modified)

58899

APTIC NO. 83088

Omori, Tokuo and Masakazu Ninomiya

FUEL INJECTION DEVICE OF INTERNAL COMBUSTION ENGINE WITH EXHAUST RECYCLING SYSTEM. (Haikigasai saijunkan kei o sonaeta nainen kikan yo nenryo funsha sochi). Text in Japanese. (Nippon Denso Co., Ltd. (Japan)) Japan. Model Util. Sho 50-30497. 6p., Sept. 6, 1975. (Appl. July 26, 1971, claims not given).

An electronically controlled fuel injection device for an automobile internal combustion engine with an exhaust gas recirculation system and an electromagnetic valve for controlled fuel injection is described. The conventional speed density method of fuel injection cannot supply the proper amount of fuel into the engine to maintain the optimum ratio of fuel/air mixture, and requires complicated fuel controls when exhaust gas is recirculated. The new process uses an electromagnetic valve which senses the rotational speed of the engine for control of fuel injection, and recirculates the exhaust gas into the intake manifold where exhaust gas will not interfere with the measuring of the rate of aspirated air flow in order to provide proper adjustment of the air/fuel mixing ratio. The process consists of the following major features: electromagnetic valves attached to fuel injection tubes and installed on the air intake manifold of the engine, and air cleaner, an air flow rate indicator, and an air flow control. The electronically controlled fuel injection supplies the proper amount of fuel into the engine based on the detected rate of air flow into the engine.

58900

APTIC NO. 82057

Oni, Lazar Adolfovich, Svetlana Sergeevna, Tomofeeva-Tomskaya, Jury Nikolaevich Korchunov, Viktor Yakovlevich Levi, Nikolai Lvovich Borisov, Nikolai Vasilievich Reprev, Anna Fedorovna Leontievskaya, Viktor Ivanovich Ryabokobylenko, and Nikolai Stefanovich Voronov

SODIUM CARBONATE REGENERATOR. (Assignee not given.) U. S. Pat. 3,915,654. 6p., Oct. 28, 1975. 6 refs. (Appl. April 10, 1973, 1 claim).

A sodium carbonate regenerator is described which is used in the pulp and paper industry for the regeneration of chemicals and the generation of power steam through the combustion of liquid waste of pulp production. The utilization of the heat resulting from the combustion of the organic portion, accounting for some 60% of the dry mass of the black ash liquor, permits generation of steam. The amount of the generated steam is largely in compliance with the requirements of the pulp production process. The generated electric power exceeds the requirements of production such that the greater the power, the higher are the parameters of the produced steam.

58901

APTIC NO. 82025

Onnen, James H.

WET SCRUBBER APPARATUS. (American Air Filter Co., Inc., Louisville, Ky.) U. S. Pat. 3,907,527. 5p., Sept. 23, 1975. 9 refs. (Appl. May 9, 1974, 5 claims).

A gas scrubbing apparatus which overcomes problems associated with the circulation of undersized contact elements is described. The fluid contact elements in the device are continuously cycled between the contact zone and an element treating zone where they are treated with a fluid and then forced back into the contact zone. A contact element removal section is disposed in the cycling area of the contact elements such that undersized elements can be removed without disturbing scrubber operation.

58902

APTIC NO. 82406

Onnen, James H.

METHOD OF CONTROLLING REACTION CONDITIONS IN A SULFUR DIOXIDE SCRUBBER. (American Air Filter Co., Inc., Louisville, Ky.) U. S. Pat. 3,897,540. 5p., July 29, 1975. 1 ref. (Appl. March 7, 1975, 5 claims).

A method of controlling reaction conditions in a sulfur dioxide scrubber is described. The process provides for forming an initial reaction product between SO₂ and a preselected SO₂ reactant material in the contact zone of a scrubbing tower. This initial reaction product is transformed into a more stable reaction product in a reaction tank remote from the contact zone of the scrubbing tower. The process includes automatically controlling the pH of the liquid in the reaction tank, which includes monitoring the conditions in the reaction tank, comparing the information from the monitor to an optimum preselected condition, and introducing a corrective portion of basic liquid into the reaction tank to attain the optimum preselected condition. The process includes using the reaction tank as a supply reservoir for liquid introduced into the contact zone of the scrubbing tower, thus insuring that the liquid is of optimum pH for the reaction. This system overcomes prior art problems and provides a straightforward inexpensive, readily employed, and easily operated system for removal of SO₂, eliminating much of the equipment previously required, using a minimum of space and providing effective control. (Author abstract modified)

58903

APTIC NO. 83168

Onufer, George R.

VAPOR EMISSION CONTROL SYSTEM AND METHOD. (Assignee not given.) U. S. Pat. 3,881,894. 12p., May 6, 1975. 5 refs. (Appl. Oct. 5, 1972, 4 claims).

A vapor emission control system for preventing the escape of gases and vapors to the atmosphere from volatile fuels during transfer of such liquids is described. The system includes a vapor collector at the fill hose nozzle which creates an annular in rushing curtain of atmospheric air around the nozzle pipe at the entrance or open end of the automobile gas tank filler neck. As gasoline enters the tank, gasoline vapors escaping back out of the filler neck are swept into the collector so that they do not escape to the atmosphere. The collector is connected to a vapor return line which communicates with a source of subatmospheric pressure whereby an atmospheric air flow is induced into the collector to create the air curtain. Because of the lack of standardization of automobile gas tank filler necks, the concept of a fuel nozzle which make a mechanically fluid tight seal with the automobile gas tank filler neck, such as in conventional systems, is impractical. (Author summary modified)

58904

APTIC NO. 83409

Oppold, J. A., H. R. Hickey, and H. C. Jones

A PERSPECTIVE ON SULFUR OXIDE CONTROL ALTERNATIVES AND IMPLICATIONS TO AGRICULTURE. Preprint, American Inst. of Chemical Engineers, New York, 23p., 1975. 29 refs. (Presented at the Complete WaterReuse: Water's Interface with Energy, Air, and Solids, National Conference, 2nd, May 4-8, 1975.)

Sulfur dioxide control alternatives are reviewed, with particular emphasis on the Tennessee Valley Authority's Sulfur Dioxide Emission Limitation (SDEL) program. The SDEL program involves intermittent control by temporarily reducing the amount of SO₂ emitted when adverse meteorological conditions are predicted to occur. The SDEL system is effective and relatively inexpensive compared to continuous control systems such as scrubbers and involves no known adverse environmental side effects. Uncertainties regarding the effects of sulfates and SO₂ on human health, vegetation, and precipitation acidity as well as the useful role that SO₂ emissions serve in terms of providing nutrient sulfur for plants make the adoption of the SDEL technique preferable to other alternatives.

58905

APTIC NO. 82220

Osa, Tetsuo, Yasukazu Oookazu, and Tomio Imai

DENITRIFICATION REACTION BY ACID AMIDE (NO₂). MODIFICATION OF EQUIPMENT AND EFFECT OF COEXISTING GAS. (San amido ni yoru dacho hanno (Dai 2 ho). Sochi no kairyo to kyozon gasu no eikyo). Text in Japanese. Preprint, Chemical Society of Japan, Tokyo, p. 35, 1975. (Presented at the Japan Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975.)

The denitrification of flue gas by acid amide, emphasizing the effects of oxygen, sulfur oxides, and carbon dioxide contained in flue gas, was investigated experimentally, and the possibility of improving solubility of nitrogen oxides in the rate determining step was investigated. A gaseous mixture containing 200-800 ppm of NO_x, 3% O₂, 50-200 ppm SO₂, and 3% CO₂ was reacted with acid amide (CH₃CONH₄, 3 M) at 25 C with a contact time of 2-20 sec using air bubble type, packed type, and shelf type reaction towers. The denitrification rate was 61.5% in the absence of coexisting gases; however, the denitrification rate varied very little with the addition of other gases (60-62%). The denitrification rate was slightly higher using the shelf type reactor compared to the other two types tested.

58906

APTIC NO. 82870

Osa, Tetsuo, Yasukazu Okatsu, and Hiroshi Takahashi

DENITRIFICATION REACTIONS BY ACID AMIDES (NO₂). 1. UTILIZATION OF ACETAMIDE. (San-amido ni yoru dassho hanno (Dai ichi-ho). Sakusan amido no riyō). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 34, 1975. (Presented at the Japan Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975, Paper 3D07.)

AIR POLLUTION ABSTRACTS, JUNE 1976

The reduction of nitrogen oxides to N₂ in aqueous acetamide solution was studied. The reaction conditions included: NO_x mixture (containing equal amounts of NO and NO₂), 200-800 ppm; acetamide concentration, 2-12 M; contact time, 1-12 seconds. The maximum denitrification of NO_x (about 65%) occurred at 20 C. For NO₂ alone, the removal rate was over 90%; for NO alone, about 30%. Denitrification decreased as temperature increased. Acetamide concentrations above 2 M had negligible effect on denitrification. After 2 seconds of contact time, the increase in denitrification was very gradual. It was assumed that dissolution of NO₂ in water to form nitrous acid, which reacts with acid amide to produce nitrogen, is a faster reaction than the reaction of N₂O₃ (NO and NO₂) with water to form nitrous acid.

58907

APTIC NO. 83876

Oshima, Tetsuo

NITROGEN OXIDES GENERATION IN COMBUSTION AND ITS CONTROLLING METHOD. (Nensho ni okeru chisso sankabutsu no hassei to sono yokusei hoho). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(10):889-899, 1975. 14 refs.

The boiler section of the Ishikawajima Harima Heavy Industries investigated the generation of nitrogen oxide resulting from combustion of various types of fuels and NO_x control methods. Laboratory tests related to the combustion characteristics of the various fuels revealed the characteristic of NO_x generation for each type of fuel combusted; i.e., generation of NO_x decreases proportionally to the decrease in oxygen, and generation of NO_x increases in proportion to the increase in the adiabatic flame temperature of the fuels if there is no nitrogen content in the fuel. For the actual control of NO_x generation, the following major methods can be used; low oxygen operation, two-stage combustion, exhaust gas recirculation, off-stoichiometric combustion, control of flames by manipulation of the burner, and a low NO_x burner method. These methods can be used singularly or in combination to reduce the amount of NO_x generated. Among these methods, low NO_x burners are expected to become a major development in combustion technology in the future for the control of NO_x, and the development and utilization of these burners are anticipated.

58908

APTIC NO. 74202

Ouchi, Hideo, Yuichi Horio, Hyogoro Aoyama, Akihiko Oi, Seiichi Nakamura, Masaomi Suzuki, Naomichi Yamaki, and Kenichi Sano

DETERIORATION OF AUTOMOTIVE EXHAUST GAS TREATMENT CATALYSTS. (Jidosha haishutsu gasu joka shokubai no rekka). Text in Japanese. Preprint, Japan Agency of Science and Technology, Pollution and Resources Research Inst., p. 20-25, 1975. (Presented at the Japan Agency of Science and Technology, Pollution and Resources Research Institute Study Meeting, 3rd, Kawaguchi, Japan, July 9-10, 1974.)

An endurance test of a granular platinum catalyst for automotive exhaust gas treatment was conducted using an engine dynamometer. The initial cleansing efficiencies for carbon monoxide and hydrocarbons were 98% and 81% respectively. There were reduced to 64% and 25% respectively, after 15,000 km of driving. The deterioration in catalytic activity was attributed to catalyst poisoning, abrasion, and heat. The lead and sulfur contents of deteriorated catalysts were considerably increased, and X-ray diffraction indicated that Pb and S (as lead sulfate) were deposited in the 200-micron layer of the catalyst surface. Calcination at 800 C in air for 5 hr decreased the S content and increased CO and HC activities, particularly the CO activity. The addition of Pb to an unused catalyst resulted in decreased HC activity, while the CO activity was increased. Therefore, the decrease in CO activity is presumably attributable to S content and HC activity to PbSO₄.

CONTROL METHODS

58915

58909

APTIC NO. 82074

Over, Charles Edward and Milford Melvin Scott

INTERNAL COMBUSTION ENGINES. (Kinematics Ltd., Betchworth (England)) U. S. Pat. 3,913,322. 5p., Oct. 21, 1975. 11 refs. (Appl. Aug. 29, 1973, 2 claims).

An internal combustion engine is described which reduces the nitrogen oxides in exhaust gases. The engine has, in communication with the exhaust system at a position where changes in exhaust gas pressure occur during running of the engine, a valve constructed and arranged so that when the pressure in the exhaust system is sub-atmospheric the valve opens to admit air into the exhaust system, and when the pressure in the exhaust system is superatmospheric the valve is at least partially closed. The exhaust gas which passes out through small apertures in the valve is drawn into the intake manifold and dilutes the intake charge. This dilution reduces the peak cylinder pressure and flame temperature. By reducing the peak pressure the instantaneous hammering and expansion of the piston rings is reduced, so that piston rings and cylinder wall wear are reduced. By reducing the peak flame temperature, the formation of NOx is greatly reduced.

58910

APTIC NO. 82655

Overy, John and John Broad

PLURAL-CYLINDER INTERNAL COMBUSTION ENGINES EQUIPPED WITH AN EXHAUST DRIVEN TURBOCHARGER. (Plessey Handel und Investments A. G., Zug (Switzerland)) U. S. Pat. 3,877,230. 3p., April 15, 1975. 4 refs. (Appl. July 12, 1973, 1 claim).

A prime mover consisting of a plural cylinder internal combustion engine equipped with a Buchi exhaust driven turbocharger is described. The exhaust turbine is equipped with two or more sets of inlet nozzles. The exhaust from each cylinder of the engine is fed respectively by a separate suitably tuned duct to a different set of these nozzles. Some of the pulsating energy due to the periodic release of the exhaust from each cylinder is utilized.

58911

APTIC NO. 82331

Oyama, Yoshishige

FUEL-AIR MIXTURE HEATING DEVICE FOR INTERNAL COMBUSTION ENGINES. (Hitachi Ltd. (Japan)) U. S. Pat. 3,892,211. 8p., July 1, 1975. 8 refs. (Appl. Dec. 13, 1972, 13 claims).

A fuel-air mixture heating device for internal combustion engines is described which reduces the pollutants in exhaust gas. The low-volatile components of the fuel are separated from the high-volatile components after the fuel-air mixture has been heated. The low-volatile components may be concentrated to flow close to the axis of the intake manifold, that is, to flow away from the inner wall of the intake manifold. The fuel air mixture is cooled to a suitable temperature before it is charged into a cylinder. Unlike other devices, this device is capable of heating the fuel-air mixture without adversely affecting the charging efficiency throughout the whole range of engine speed.

58912

APTIC NO. 81998

Paccione, James Dennis and David Moore O Meara

HEAT TREATMENT OF WASTE SLUDGES. (Chicago Bridge and Iron Co., Oak Brook, Ill.) U. S. Pat. 3,913,500. 7p., Oct. 21, 1975. 6 refs. (Appl. May 1, 1974, 23 claims).

A method for heat treating and incinerating sewage sludge is described which overcomes problems associated with scaling and fouling and effectively destroys odors from gases evolved during the conditioning of the sludge. The high moisture sewage sludge is continuously fed through a heat exchanger located in heat exchange relationship with a granular fluidized bed and is held at an elevated temperature and pressure for a time sufficient to permit effective conditioning. The conditioned sludge is then dewatered to raise the solids level to at

least 10 wt%. The dewatered sludge is then fed into the fluidized bed where it is incinerated. Non-condensable gases like ammonia, methane, and other hydrocarbons are thermally oxidized to carbon dioxide, nitrogen, and water.

58913

APTIC NO. 82034

Pan, Pei-Tai

METHOD AND APPARATUS FOR INCINERATING SLUDGE. (Colt Industries Operating Corp., New York) U. S. Pat. 3,903,813. 6p., Sept. 9, 1975. 6 refs. (Appl. May 28, 1974, 7 claims).

A spray type liquid sludge incinerator is described which overcomes prior art problems associated with smoke formation, nozzle clogging, and flame quenching. The liquid sludge is forced into a combustion chamber under pressure to produce a fine spray which enters at an angle diverging from that of a burner flame in the chamber. The burner flame is drawn into the low pressure zone created by the cold expanded liquid sludge spray to create a turbulent combustion reaction within the chamber which results in optimum oxidation of both the waste solids and undesirable gases. (Author summary modified)

58914

APTIC NO. 82738

Panzer, Jerome

IDLE EMISSION TESTING: SOME EFFECTS OF ENGINE MALFUNCTIONS ON EMISSIONS. Preprint, Exxon Research and Engineering Co., Linden, N. J., 23p., 1975. 8 refs. (Presented at the North American Motor Vehicle Emissions Control Conference, Annual, 4th, Anaheim, Calif., Nov. 1975.)

The effect of engine malfunctions on automobile exhaust emissions was evaluated for over 500 vehicles. Hydrocarbon deterioration peaked a few months after inspection/maintenance, and rejected cars were more likely to fail future emission inspections than non-rejected cars. The dependence of emissions on engine malfunctions was demonstrated by the fact that the 50% highest emitting cars accounted for about 70% of all engine malfunctions. Carburetor replacement on older cars appeared likely to produce significant reductions in carbon monoxide and hydrocarbons over those obtainable from other engine repairs. Nitrogen oxide measurements at 2500 RPM and Key Mode conditions were equally effective in identifying cars with high NOx emissions. However, the range of NOx values in the car population was too great to establish test standards which correctly identify a high percentage of malfunctioning cars and avoid rejecting cars not needing repairs. Generally, non-loaded emissions testing was as effective as Key Mode testing in reducing emissions. (Author conclusions modified)

58915

APTIC NO. 82817

Papadatos, K., W. Y. Svrcek, and M. A. Bergougnou

HOLDUP DYNAMICS OF A SINGLE STAGE GAS-SOLID FLUIDIZED BED ADSORBER. Can. J. Chem. Eng., 53(6):686-690, Dec. 1975. 8 refs.

The dynamics of the tray solids holdup for a single stage gas-solid fluidized bed adsorber with a downcomer was studied. The method chosen was based on an experimental relationship of the holdup to the solids flow rate. An 11 inch diameter four-stage fluidized bed adsorber was used for the experiment. The support trays were perforated with 10% free area and the downcomers were removable so that the weir height and the weir diameter could be easily varied. The solids were activated carbon of 420 micron charged onto the top tray and measured by a flowmeter. When the column to weir diameter ratio was 4.4 and 8.8 this relationship was linear, implying first order dynamics. The time constant was not affected by the superficial gas velocity, but was a linear function of the weir height. The weir diameter and the particle density of the solids also showed an effect. Specifically, the time constant increased with the particle density and with decreasing weir diameter. When the column to weir diameter ratio was increased to 13.5

the holdup to solids flow rate relationship was nonlinear. (Author abstract modified)

58916

APTIC NO. 76512

Parekh, Rashmi

EQUIPMENT FOR CONTROLLING GASEOUS POLLUTANTS. *Chem. Eng./Deskbook*, vol. 1975:129-133, Oct. 6, 1975.

Equipment for controlling gaseous pollutants is classified according to the function it performs. Gas liquid absorption processes are carried out in vertical countercurrent flow through packed, plate, or spray towers. The equipment falls into the following categories: dispersed gas: impingement plate scrubbers; dispersed liquid: packed towers, wetted-wall towers; dispersed liquid: spray towers, venturi scrubbers. A major factor in the successful operation of a scrubber is the proper selection of materials for construction. The units are subjected to harsh environments created by industrial gases such as sulfur dioxide, sulfur trioxide, hydrogen chloride, hydrogen fluoride, and chlorine, which form sulfurous, sulfuric, hydrochloric, and hydrofluoric acids as they enter the liquid phase. Materials selections must be based on specific application requirements. Incineration is the simplest route when the gas streams are combustible. Direct flame and catalytic oxidation are the two methods in common use today.

58917

APTIC NO. 76557

Parker, K. R. and C. Rabant

CONTROLLING OF AIR POLLUTION DUE TO INDUSTRIAL DUST EMISSIONS. (*Contrôle de la pollution par les poussières dans les procédés industriels*). Text in French. *Inform. Chim.*, no. 148:183-190, 193-197, 1975. 6 refs.

Various types of equipment for removal of dust from industrial waste gases are described. The principal types now in use are: precipitation chambers, cyclones, scrubbers, sleeve filters, and electrostatic precipitators. In the precipitation chamber, through which the gas to be purified flows at low speed, the dust particles drop out by gravity. This equipment is generally not usable for particle sizes below 100 micron. The cyclone is based on the principle of an induced spiral flow of the gas, whereby the dust particles are thrown out by centrifugal force and accumulate at the chamber walls. The minimum particle size is about 10 micron. The scrubber is based on the principle of forming droplets around the dust particles by spraying water against the flowing gas. One of the most effective types is the venturi scrubber which is suitable for particle sizes above 0.1 micron. It is used, for instance, for purification of blast furnace gases. Sleeve filters can be built for considerable capacities. The material of the sleeves is chosen to suit the operating temperature and the required resistance to water and chemicals involved. Glass fiber filters can withstand temperatures up to 300 C. The widely used electrostatic precipitator is based on the phenomenon that particles which are electrically charged in an electric field are attracted by the electrodes which create the field. The electrostatic precipitator can effectively handle particle sizes down to about 0.01 micron, at gas temperatures up to about 500 C.

58918

APTIC NO. 76234

Patchett, R. J.

THE MEASUREMENT OF POWDER EMISSION FROM SPRAY DRIER EXHAUSTS. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand*, 1975. p. 539-559. 5 refs. (Feb. 17-21.)

Measurements of the level of milk powder emissions in the exhaust of spray driers in New Zealand dairy factories were performed. The average powder emission from 23 driers with cyclone collection systems was 225 mg/cu m. The higher average rates of emission of skim milk powder occurred with driers using cyclone collection systems consisting of many

AIR POLLUTION ABSTRACTS, JUNE 1976

small cyclones. The average emission systems consisting of many small cyclones. The average emission rate for the latter was 330 mg/cu m. Milk powder emissions from driers were reduced as the fat content of the powder being manufactured was lowered. Thus, where the emission of skim milk powder is excessive and cannot be corrected immediately, the manufacture of milk powder with a higher fat content can be used as an interim control technique. (Author abstract modified)

58919

APTIC NO. 82983

Patton, James D.

POLLUTION CONTROL SYSTEM FOR INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,875,916. 6p., April 8, 1975. 6 refs. (Appl. Aug. 18, 1969, 4 claims.)

A pollution control system for internal combustion engines is described. It includes a crankcase unit for scavenging the blowby gases from the oil pan and an exhaust unit for scavenging the exhaust gases in the engine and exhaust manifold. Unlike other systems, this system is efficient in operation, is economical to manufacture and install, and extends the normal life of the engine with which it is associated. (Author abstract modified)

58920

APTIC NO. 82737

Payton, R. Neil

INNOVATIONS IN FERROALLOY BAGHOUSE SYSTEM DESIGN. Preprint, *Air Pollution Control Assoc., Pittsburgh, Pa.*, 12p., 1975. (Presented at the Air Pollution Control Association Specialty Conference on the User and Fabric Filtration Equipment, Buffalo, N. Y., Oct. 5-7, 1975.)

The design of baghouse systems serving electric furnaces emitting silicon dioxide fumes at a ferroalloy production facility is reviewed. A combination of Nomex filter cloth and shaker mechanisms are used to permit a 2.75:1 air-to-cloth ratio. Bag pressures of up to 16-18 in. are not uncommon. All bags are a standard 11.5 in. in diameter by 30.5 ft in height. Forced convection, tubular, air-to-gas cooling is used to cool the gas from 500 F or more down to 375-400 F. A unique hook-up of magnetohelic gages provides an instant assessment of the performance of each bag compartment to assist operators in achieving optimum operation.

58921

APTIC NO. 79232

Peacy, Jon

DESIGN CRITERIA FOR A HOT PRECIPITATOR. Preprint, *Air Pollution Control Assoc., Pittsburgh, Pa.*, 12p., 1975. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-02.4.)

A precipitator collecting particulate matter from the combustion of a low sulfur containing fuel is discussed as a means of limiting sulfur and particulate emissions. The electrical resistivity of the fly ash from low sulfur coal combustion is usually very high. Raising the temperature of the combustion products above 450 F is considered as a method of reducing this high resistivity and facilitating collection of the fly ash. Selection of design criteria for a hot electrostatic precipitator is discussed.

58922

APTIC NO. 76194

Pengidore, D. A.

SINTER PLANT WINDBOX GAS RECIRCULATION SYSTEM DEMONSTRATION-PHASE I. ENGINEERING AND DESIGN (FINAL REPORT). *National Steel Corp., Weirton, W. Va., Weirton Steel Div., Environmental Protection Agency Contract 68-02-1364, Program Element 1AB015, ROAP 21AQR-005, Rept. EPA-600/2-75-014*, 132p., Aug. 1975. 87 refs.

CONTROL METHODS

58928

Windbox gas recirculation, as applied to a sinter plant, involves the return of a portion of the windbox exhaust gas to a hood above the sinter bed. The tradeoffs of recycle ratio versus oxygen content, moisture content, and temperature of the gases about the bed; total power consumption; and other important parameters are developed. The basis for this parametric study, as well as for the full scale design developed therefrom, is operational and emissions data from two large modern sinter plants. Recycle is projected to reduce hydrocarbon emissions to acceptable levels at reduced power consumption and capital cost relative to more conventional approaches. The advantages and disadvantages of various devices for final control of particulates are weighed: a gravel bed filter was the final choice. (Author abstract)

58923

APTIC NO. 82066

Penney, Gaylord W.

ELECTROSTATIC DUST FILTER. (Assignee not given.) U. S. Pat. 3,910,779. 8p., Oct. 7, 1975. 28 refs. (Appl. July 23, 1973, 14 claims).

An electrostatic fabric filter for removing dust particles or other particulate matter from a stream of air or other gas is described. The dust particles are electrically charged and are deposited on the filter member in an electric field maintained at the surface of the filter. The dust particles deposit in a relatively porous layer having a lower low pressure drop across the filter element than conventional filters. (Author abstract modified)

58924

APTIC NO. 83236

Perekupka, I. A., G. N. Mokrotovarova, S. G. Kolesnikova, and N. T. Meshenko

REMOVAL OF SULFUR COMPOUNDS FROM AUTOMOBILE GASOLINE BY WATER VAPOR. (Parovaya ochistka avtomobil nogo benzina ot senistykh soedineniy). Text in Russian. Katal. Konvers. Uglevodorodov, vol. 2:151-154, 1975. 17 refs.

The conditions for using some industrial contacts during the removal of sulfur (S) compounds from automobile gasoline A-72 by hydrolysis were investigated in a laboratory setting containing a plunger pump for simultaneous feeding of water and gasoline, a quartz reactor, a condenser, and a separator to isolate liquid products from gaseous ones. Cleaning with catalyst model GIAP-10-2 reached 96% when water vapor was used as opposed to 77% without it. In view of the high level of cleaning achieved and the continuation of the catalyst at maximum efficiency, the most promising catalysts for removing S compounds from automobile gasoline by water vapor are the industrial zinc oxide (GIAP-10-2) and the laboratory aluminochromium contacts applied to active aluminum oxide.

58925

APTIC NO. 76231

Persson, Goran A.

AIR POLLUTION CONTROL IN THE SWEDISH PULP INDUSTRY. The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 492-510. 1 ref. (Feb. 17-21.)

Air pollution control measures being used in the Swedish pulp industry are reviewed. Odorous gases from digesters, evaporator units, and condensate cleaning units are collected and incinerated. Sulfur dioxide emissions from recovery furnaces are minimized by the use of sulfur-free chemicals and stack gas scrubbing. All soda recovery boilers in Sweden are equipped with electrostatic precipitators for the control of particulate emissions. Precipitator-scrubber combinations result in collection efficiencies well above 99%. Some sulfite mills are also using fluidized ball bed absorption for waste gas cleaning. Gas leaving an electrostatic precipitator passes through a venturi cooling scrubber which cools the gas down to a temperature suitable for absorption in the fluidized bed tower. About 5% of the SO₂ is absorbed in the venturi scrubber, and the rest is absorbed in the fluidized bed tower. Characteristic features of

the above type of system are high SO₂ absorption efficiency (95-97%) and a dust collecting efficiency which allows for outlet dust concentrations of between 15-20 mg/normal cu m. Emission standards and general requirements adopted by the Swedish Environment Protection Board are also reviewed.

58926

APTIC NO. 82484

Peterson, Morris W., Brett C. Krippene, and David M. Marshall

FUEL BURNER. (Babcock and Wilcox Co., New York) U. S. Pat. 3,904,349. 6p., Sept. 9, 1975. 4 refs. (Appl. May 22, 1974, 5 claims).

An improved fluent fuel burner is described for reducing the formation of nitric oxides by lowering the combustion zone temperature and providing a reducing atmosphere in the ignition zone. The apparatus includes three individual airflow passages and separate means for apportioning the flow of combustion air among the passages so as to achieve complete combustion of the fuel while reducing the formation of nitric oxides. A more complete burning fluent fuel is achieved than has been possible before. (Author abstract modified)

58927

APTIC NO. 83209

Petersson, Stig Arvid

GAS PURIFICATION METHOD. (Boliden Aktiebolag, Stockholm (Sweden)) U. S. Pat. 3,899,308. 4p., Aug. 12, 1975. 5 refs. (Appl. April 26, 1974, 5 claims).

A process for selective purification of hot gases containing complex metallic dust is described. The gas is led to a warm electrostatic precipitator where particle formed material is separated. The gas is cooled by vaporization allowing gaseous products to condense and be subsequently separated by a second electrostatic precipitator. The gas is then washed with water to remove any remaining particles still present, and the same water is used in the cooling process as vaporization medium. The solid substances contained in the fluid become freely floating particles which are effectively precipitated in the subsequent dust filter. The method gives practically 100% selective recovery of the waste gas dust content and at the same time obviates the discharge of the water used for washing which is common practice in other methods.

58928

APTIC NO. 83065

Petherbridge, R. J. S.

DEODORISING FOUL GAS STREAMS WITH OZONE. Process Eng., vol. 1975:98-99, Feb. 1975.

Ozone treatment for foul gas deodorization has been acknowledged as a technically effective method for many years, but this interest has not generally developed into working applications. Interest in ozone treatment has been intensified with increasingly stringent environmental standards. The application of chemical engineering design principles to deodorization can result in significant cost reductions. Prior onsite testing provides accurate design information for the particular gas stream to engineer full-scale plants. The concept of compound operation plants makes it possible to use the full range of deodorization techniques for an optimized design. Ozone has significantly reduced odors from maggot farms, herbicide manufacture, insecticide processing, carpet drying, cellulose film manufacture, antibiotic manufacture, and animal byproduct processing. The concentration of odiferous components in the foul gas stream is not constant in many instances, and modulation of ozone output is required. Ozone output is dependent upon the power input to the generator, the frequency of the applied power, and the flow rate of air to the generator. The capital costs of ozone treatment schemes are dependent upon the quantity of contaminant in the foul gas and on the total foul gas flow. Operating costs are essentially electricity for the compressor, dryer, and ozone generator.

Pfefferie, William C.

METHOD AND FURNACE APPARATUS. (Engelhard Minerals and Chemicals Corp., Murray Hill, N. J.) U. S. Pat. 3,914,090. 14p., Oct. 21, 1975. 2 refs. (Appl. Oct. 8, 1974, 46 claims).

A method for burning carbonaceous fuels in a furnace while achieving low air pollutant emissions is described which is easier to operate and control than prior art methods and results in greater thermal efficiency. The carbonaceous fuel is thermally combusted with an amount of air that is substantially less than that needed for complete combustion to produce a gaseous effluent containing a substantial proportion of carbon monoxide but little or no nitrogen oxides. Additional carbonaceous fuel is mixed with air, and a portion of this mixture is passed into the presence of a solid oxidation catalyst for adiabatic combustion at a temperature above the instantaneous auto-ignition temperature of the mixture but below nitrogen oxide-forming temperatures. The first gaseous effluent and the gases exiting the catalyst are then mixed, and thermal combustion occurs to produce a completely combusted final effluent which is low in atmospheric pollutants, particularly nitrogen oxides. (Author abstract modified)

Pfenninger, Hans

STEAM PLANT WITH PRESSURE-FIRED BOILER. (BBC Brown Boveri and Co., Ltd., Baden (Switzerland)) U. S. Pat. 3,884,036. 5p., May 20, 1975. 3 refs. (Appl. Nov. 27, 1973, 3 claims).

A steam power plant is described which provides steam to drive a steam turbine coupled to an electrical generator. It includes a pressure fired boiler whose fuel flow rate is controlled by a livestream regulator and a pressure charging set. It is driven by a gas turbine powered by the exhaust gas from the boiler and a starter motor, all on the same shaft. In comparison with the prior art, this system operates with good overall efficiency, such that on the gas side no additional heat exchanger is required after the pressure fired boiler, and yet the stack losses remain within the limits customary with such a plant. (Author abstract modified)

Pike, Daniel E.

GAS TREATING APPARATUS. (Air Pollution Industries, Inc., Englewood, N. J.) U. S. Pat. 3,894,853. 7p., July 15, 1975. 9 refs. (Appl. July 10, 1974, 4 claims).

A gas treating apparatus is described which is particularly useful in conjunction with blast furnace operations. It consists of a plurality of venturi scrubbers integrated with a gas cooling and cleaning tower, which operate in parallel. The venturi scrubbers may be closed individually for servicing without necessitating the shutting down of the entire gas treating apparatus. This is an improvement over other systems.

Pillard, Marcel T.

RESIDUAL GAS BURNER WITH SUPERIMPOSED, INCREASING SIZE BURNING CHAMBERS. (Assignee not given.) U. S. Pat. 3,885,919. 5p., May 27, 1975. 5 refs. (Appl. Nov. 19, 1973, 11 claims).

An apparatus for burning residual gases is described which has superimposed increasing size burning chambers. Unlike other devices, this device attains a good quality of combustion of the gaseous effluents under all conditions, including variations in the outflow and velocity of effluents. The gaseous effluents are burned in flare stacks of average height. At the top of the chimney stack, a high vertical output speed of the gases, of the order of 25 to 35 meters/sec is attained at the maximum outflow. The gases generally reach almost the same altitude as that to which the conventional tall flare stacks take them.

Piller, Wulf, Manfred Rudolph, Helmut Schaefer, and Uwe Wolff

ENERGETIC CONSIDERATIONS CONCERNING MODIFICATION OF POWER-HEAT-COUPLING. (Energetische Ueberlegungen zur Modifikation von Kraft-Waerme-Kupplungen). Text in German. Brennstoff-Waerme-Kraft, 27(12):456, 1975. (Full length text of 44 pages can be obtained from VDI-Verlag, GmbH, 4 Dueseldorf 1 Postfach 1139, West Germany).

General energetic, technical and economic considerations on power-heat coupling for waste heat utilization in fossil-fired and lightwater reactor nuclear power plants are presented. Using a condensation power plant used for electricity generation and a heating plant as reference bases, the yearly fuel consumption of a power-heat coupling system which increases the saturation temperature to 90 C is lower by 13%. The yearly fuel economy is highest (22%) for a power plant with pass-out condensing turbine. Waste heat utilization by means of a heat pump assumes an intermediate position regarding economy.

Pischinger, F.

AUTOMOBILE FUELS OF THE FUTURE. (Fahrzeugtreibstoffe der Zukunft). Text in German. Preprint, Rheinisch-Westfaelischer Technische Hochschule Aachen (Germany), Lehrstuhl fuer Angewandte Thermodynamik, 12p., 1975.

The fuels of the future, e.g., methane, hydrogen, synthetic gasoline, ammonia and hydrazine are discussed. Of them, methane and hydrogen are entirely non-toxic and offer the greatest advantages with regard to environmental pollution, including production, storage, and distribution. Synthetic gasoline is more polluting due to the high fraction of aromatic compounds. Ammonia and hydrazine are highly toxic. Both hydrogen and methane, but particularly methanol, are well suited for operation in Otto engines. Ammonia is less suitable, and hydrazine can be used only in fuel cells. Adjustments of the engine to these new fuels are generally necessary, with the exception of synthetic gasoline. All German studies have come to the conclusion that methanol will be the preferred fuel of the future while all American studies put the synthetic Otto and diesel fuels in first place, because of greater reserves of oil shale in the U. S.

Polach, Wilhelm

INVESTIGATIONS ON THE INFLUENCE OF THE DIFFERENT CHEMICAL STRUCTURE OF FUELS ON THE EXHAUST EMISSIONS USING AN ENGINE WORKING ON DIFFERENT COMBUSTION PRINCIPLES. (Der Kraftstoffeinfluss auf die Schadstoffemission von Motoren mit unterschiedlichen Verbrennungsverfahren). Text in German. Motortech. Z. (Stuttgart), 36(10):274-279, 1975. 8 refs.

Fuel consumption and exhaust emission characteristics of various hydrocarbon fuels are investigated. Nitrogen oxides emissions and soot formation are especially influenced by the fuel chemical structure. Alcohols and alcohol-water blends reduce nitrogen oxides and soot. The main influence on hydrocarbon emissions appears to be the vaporization mechanism during the formation of inhomogeneous air-fuel mixtures. Carbon monoxide emissions are not affected by the differing compositions of the fuels studied. The most effective alternative fuels are benzene, straight-run gasoline, and alcohols; these were studied in a 4-stroke engine, operating on diesel and otto cycles. The influence of different fuels on exhaust emissions using these cycles is smaller than using two-stage combustion with stratified charge in the swirlchamber.

58936

APTIC NO. 81973

Pope, Michael, Benjamin Molayem, and Shelton Ehrlich

FLUIDIZED-BED COMBUSTION OF HIGH SULFUR COALS AND COAL BY-PRODUCTS. Preprint, Pope, Evans and Robbins, Alexandria, Va., 20p., 1975 (?). 4 refs.

A pilot 5000 lb/hr fluidized bed boiler for the control of sulfur dioxide emissions resulting from the combustion of high-sulfur coal or coal cleaning plant residues is described. Sulfur dioxide in the atmospheric fluidized-bed boiler is controlled by the addition of limestone. The optimum temperature for combustion and sulfur capture is between 1500 and 1600 F. Excess oxygen runs at about 3%, and the superficial gas velocity is 12 ft/sec at full load. The Environmental Protection Agency limit for new coal-fired boilers of 1.2 lb SO₂/million Btu input is readily met for any coal tested thus far. Elemental sulfur can be recovered as a by-product if sulfated lime is regenerated in an interconnected cell.

58937

APTIC NO. 82975

Postma, Peter

EXHAUST GAS SILENCER. (Sherritt Gordon Mines Ltd., Fort Saskatchewan (Canada)) U. S. Pat. 3,889,776. 5p., June 17, 1975. 14 refs. (Appl. Aug. 21, 1973, 10 claims).

A completely open gas exhaust silencer is described. It consists of an elongated hollow baffle casing having an open end and a closed end. An inlet conduit is attached to the closed end of the baffle casing. An end portion of the inlet conduit extends into the baffle casing. This end portion is coaxially encircled by a hollow cylinder having a plurality of perforations formed on its cylindrical wall. A filter cap is removably mounted on the hollow cylinder and located transversely and directly opposite to the end opening of the inlet conduit. A porous member is mounted in the filter cap to break up the exhausted noisy gas into a number of random gas streams in order to reduce the gas velocity. A lining of sound absorbing material is disposed on all side walls of the baffle casing to absorb the noise in the random gas streams. This construction is less complicated and expensive to fabricate than other open silencers. (Author abstract modified)

58938

APTIC NO. 80291

Potter, E. C. and C. A. J. Paulson

WHAT SIZE PRECIPITATOR? A NEW BASIS FOR DESIGNING PLANT TO SPECIFIED DUST-EXTRACTION PERFORMANCE. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 159-175. 6 refs. (Feb. 17-21.)*

Relationships between electrostatic precipitator size and collection efficiency are reviewed, and a method for designing precipitators to a specified dust extraction performance is described. The theoretical relationship between precipitator efficiency and size is logarithmic and is principally affected by the applied electric field, the specific collecting area of the precipitator, and the size of the particles being collected. A graphical procedure which yields the precipitator performance line is developed to account for these parameters. The latter two parameters are directly related to the logarithm of the particulate slip through the precipitator, while the square of the electric field is directly related to the logarithm of the particulate slip. Good agreement is obtained between the above predictions and field tests of precipitators collecting fly ash. (Author abstract modified)

58939

APTIC NO. 80271

Powell, H. E., W. M. Dressel, and R. L. Crosby

CONVERTING STAINLESS STEEL FURNACE FLUE DUSTS AND WASTES TO A RECYCLABLE ALLOY. Bureau of Mines, Rolla, Mo., Rolla Metallurgy Research Center, RI 8039, 24p., 1975.

Recovery of the metals in dusts and wastes from stainless steel manufacture was investigated. Preliminary studies were conducted to delineate the most promising areas for detailed research. Results of the preliminary studies indicated pyrometallurgy as most promising. Tests involving pelletizing, smelting, reduction with carbon, and reduction with carbon plus scavenging with ferrosilicon were made on various dusts and mixtures of wastes. Electric furnace dusts from the production of stainless steel are amenable to reduction and yield a recyclable stainless steel. Maximum recovery of the metals, especially chromium, requires reduction with carbon followed by a scavenging reduction with ferrosilicon. All electric furnace dusts investigated were amenable to pelletization. Requirements for binder vary from dust to dust. Mill scale or centerless grinding swarf may be incorporated into the pellets with furnace dusts and smelted without change in technique. Cutting oils in the swarf do not have a deleterious effect on the pellets or on the subsequent smelting process.

58940

APTIC NO. 83055

Powell, H. E., W. M. Dressel, and R. L. Crosby

EXPERIMENTAL METALS RECLAMATION PROCESS RECOVERS ALLOYS FROM STEEL MILL WASTES.

Thirty-three (33) Mag., vol. 1975:48-50, April 1975.

A laboratory-scale process for the recovery of expensive and scarce alloying elements from electric arc furnace flue dusts, mill scale, and grinding swarf, is described. The procedure involves pelletizing waste products, reducing them in a carbon-lined induction furnace, and casting the molten metal as an alloy which contains 10-20% chromium, 6-12% nickel, and 55-65% iron, plus lesser amounts of molybdenum and manganese. The alloy is essentially free of zinc, lead, and sulfur which are driven off as oxide fumes.

58941

APTIC NO. 84358

Princiotta, Frank

STACK GAS SCRUBBING - THE PRO VIEWPOINT. *Air Pollution Control Assoc., Pittsburgh, Pa., Mid-Atlantic States Section, Air Pollution Control Assoc. Semi-Ann. Tech. Conf. Proc. Sulfur Fuels - Problems Alternative Solutions, Wilmington, Del., 1975, p. 65-94. 1 ref. (April 25.)*

Evidence in favor of the use of stack gas scrubbing for the control of sulfur dioxide from steam electric plants is presented. Availability data for several flue gas desulfurization systems are presented to illustrate that reliability with such systems is not a problem. Regarding solid waste disposal, data are cited to illustrate that sludge production rates represent only a relatively small fraction of the total waste associated with coal fired electricity production. Operation of scrubbers in closed loop modes and the use of pond liners in closed-loop systems employing well-engineered disposal sites are presently available techniques for drastically reducing the adverse environmental effects of scrubber waste problems. A National Academy of Science study is cited to illustrate the seriousness of the relationship between adverse health effects and sulfur dioxide emissions from steam electric generating plants and other major sources. The use of intermittent control for reducing SO₂ emissions is a practical control alternative only in carefully defined situations.

58942

APTIC NO. 82056

Priest, Glen R.

OIL RECONDITIONING DEVICE. (Assignee not given.) U. S. Pat. 3,915,860. 6p., Oct. 28, 1975. 4 refs. (Appl. Dec. 26, 1973, 7 claims).

A device for reconditioning lubricating oil in an internal combustion engine is described. The first improvement in the oil systems of internal combustion engines was the addition of a mechanical type oil filter which uses a fibrous filter material for removing solid contaminants from the circulating oil. This type of system, however, is essentially ineffectual for removal

of liquids such as water and fuel which become entrained in and emulsified with the oil. Heating units are added to lubrication oil filter systems to drive off vaporizable contaminants to further recondition the oil to a higher degree possible than achieved with only the fibrous filter material. Some of the available systems which include heaters are arranged so that they may pull in dirt. Some units that vent at the top and may malfunction, resulting in oil being blown to the atmosphere. Such units cannot be used where the vehicle operates on a steep incline, as do aircraft. The current need to conserve oil and improve air quality has made many available oil reclaimers obsolete. In this device, the removed contaminating vapors are directed into the engine intake to reduce the emission of air pollutants to the atmosphere. The oil is heated by either electrical means or by the exhaust from the engine on which the device is mounted.

58943

APTIC NO. 81990

Proctor, Albert Edward

COMBUSTION APPARATUS. (Flaregas Engineering Ltd., West Drayton (England)) U. S. Pat. 3,914,093. 6p., Oct. 21, 1975. 5 refs. (Appl. Jan. 9, 1974, 13 claims).

A combustion apparatus for use as a ground flare is described. The device consists of a nozzle for discharging waste gas, an air inducing device with an inlet for receiving the discharged waste gas and air induced into the device, and a means for varying the distance between the inlet of the air inducing device and the discharge means. The air inducing device preferably operates on the Coanda effect and uses steam as an inducing medium so that the device discharges a mixture of air, waste gas, and steam into a combustion zone. Smokeless control of the combustion process is achieved by varying the distance between the outlet of the discharge means and the inlet of the air inducing device.

58944

APTIC NO. 83751

Putney, David H.

CLASSIFYING CENTRIFUGAL SEPARATOR. (Stratford Engineering Corp., Kansas City, Mo.) U. S. Pat. 3,885,933. 9p., May 27, 1975. 5 refs. (Appl. Sept. 20, 1974, 4 claims).

An apparatus for separating finely divided particles or dust from gases is described. It is a classifying centrifugal separator which collects particles of greater size and weight in a separate zone from particles of lesser size and weight, for separate handling. A quadruple tube classifying centrifugal separator employing centrifugal force powered bleedblack is used to aid classification and separation. Unlike other separators, this device is efficient without the use of multiple separators and the associated apparatus and attendant duct work.

58945

APTIC NO. 83378

Pythoud, S.

MEASURES FOR ENVIRONMENTAL PROTECTION AT THE CIBA-GEIGY PLANT IN MONTHÉY. (Mesures de protection de l'environnement de l'usine Ciba-Geigy a Monthey). Text in French. Gas, Wasser, Abwasser, 55(11):745-748, 1975.

The purification station (STEP) at the Ciba-Geigy chemical plant in Monthey is in the process of completing a gas purification system to treat the mercury-laden combustion gases coming from the station. Chlorinated solvents are extensively used and their disposal is polluting. An oven installation is scheduled to be completed in June to assure perfect combustion and purified gases. It will consist of a rotating drum for the solid wastes and a vertical oven for the solvents or other liquid wastes. The fumes from both ovens will go through scrubbers before passing through an electrostatic filter which will complete the cleaning process. For the time being, the chlorinated wastes are being burned at sea. Toxic gases such as chlorine and carbonyl chloride are neutralized and destroyed in an alkaline solution. Sulfur dioxide emitted from the pigment factory is oxidized into sulfate and is then poured

AIR POLLUTION ABSTRACTS, JUNE 1976

into a chemical stream which will carry it to STEP where it will be precipitated into calcium sulfate.

58946

APTIC NO. 80108

Quartulli, O. J.

STOP WASTES: REUSE PROCESS CONDENSATE.

Hydrocarbon Process., 54(10):94-99, Oct. 1975.

Methods of recycling process condensate are discussed with emphasis on high capacity ammonia plants. Overall performance is improved and atmospheric pollution eliminated by a modified overhead reflux and product recovery system with provision for using low level heat in conjunction with operation of the carbon dioxide removal system regenerator. The small amount of liquid product taken from the overhead of the condensate stripper, water, ammonia, CO₂, methanol, and trace organics is recycled by injection into the reforming facility. Two other methods apply particularly to plants using natural gas feed and to water short locations. They involve the use of a saturator tower for natural gas feed prior to reforming and do not require a condensate stripper. The principles outlined for condensate recovery for ammonia units apply equally as well as to other processes including methanol, hydrogen, and urea manufacture.

58947

APTIC NO. 82129

Quigg, Harold T. and Robert M. Schirmer

GAS TURBINE COMBUSTORS AND METHOD OF OPERATION. (Phillips Petroleum Co., Bartlesville, Okla.) U. S. Pat. 3,915,619. 25p., Oct. 28, 1975. 5 refs. (Appl. April 11, 1974, 28 claims).

A gas turbine combustor that is suitable as a power plant for motor vehicles and is capable of reduced nitrogen oxide emissions is described. The combustor includes: a flame tube, an air inlet means for introducing a first stream of air into the upstream end portion of the flame tube, a fuel inlet means for introducing a fuel into the upstream end portion of the flame tube, at least one opening provided in the flame tube wall at a first station located halfway between the upstream and downstream ends of the flame tube, a first conduit means communicating with the opening at the first station for maintaining a second air stream separate from the first stream and for admitting the second air stream into the interior of the flame tube, at least one other opening in the flame tube wall at a second station located downstream from the first station, and a second conduit means surrounding the flame tube and communicating with the opening at the second station for maintaining a third air stream separate from the first and second air streams. The third stream flows in a downstream direction and in heat exchange with the outer wall of the flame tube to remove heat from the primary combustion zone and reintroduce the heat into the combustor at a region downstream from the primary and secondary combustion zones.

58948

APTIC NO. 76016

Rao, A. K., M. P. Schrag, and L. J. Shannon

PARTICULATE REMOVAL FROM GAS STREAMS AT HIGH TEMPERATURE/HIGH PRESSURE (FINAL REPORT). Midwest Research Inst., Kansas City, Mo., Environmental Protection Agency Contract 68-02-1324, Task 30, Program Element 1AB012, ROAP 21ADL-004, Rept. EPA-600/2-75-020, 85p., Aug. 1975. 43 refs.

NTIS: PB 245858/AS

Methods for removing particulate matter from high-temperature and/or high-pressure gas streams are reviewed along with theoretical models of aerosol collection and agglomeration mechanisms. The effectiveness of collection and agglomeration mechanisms in many instances appears to decrease with increases in temperature and pressure. The influence of temperature and pressure is closely related to aerosol particle size in many applications, and generally increases in these parameters result in a decrease in the effectiveness of operative col-

CONTROL METHODS

lection mechanisms for particles greater than 0.5 micron in diameter. Types of control equipment which utilize promising mechanisms as primary capture techniques are: cyclones, special filter types such as gravel beds and metallic fibers, scrubbers which do not cool the gas stream, and electrostatic precipitators. (Author summary modified)

58949

APTIC NO. 82685

Rapp, Herbert

RECOVERY OF POWDER IN AN ELECTROSTATIC POWDER SPRAYING OPERATION. U. S. Pat. 3,899,311. 11p., Aug. 12, 1975. 7 refs. (Appl. April 18, 1973, 20 claims).

A filter chamber of a powder recovery apparatus has an inlet through which a powder-carrying air stream is admitted, and an outlet. Filter elements are interposed between the inlet and outlet to intercept and retain the powder particles, and a pneumatically operated vibrating arrangement can vibrate the filter elements within the chamber so as to separate the retained powder particles from the filter elements. A collecting bin is provided below the chamber for collecting the separated powder particles. Details of the construction of the vibrating arrangement and the filter elements, as well as of the collecting bin, are also disclosed together with details of a safety arrangement which operates in the event of blocking, deflagration, or should actual combustion occur at the spraying station of the installation with which the recovery apparatus cooperates. (Author abstract)

58950

APTIC NO. 82452

Rasch, R.

SOLID WASTE TRÉATMENT IN THE NETHERLANDS. (Abfallbehandlung in den Niederlanden). Text in German. Energie (Munich), 27(7/8):194-197, 1975. 1 ref.

The state of the art of waste disposal in the Netherlands is presented. Waste composting is declining, while waste incineration is being promoted as the most environmentally acceptable method of waste disposal. The waste heat generated is used for electricity generation or for remote heating. In some incinerator plants, the hot flue gases are used for the desiccation and incineration of sewage sludge in a rotary furnace. Because of the generation of vapors during the drying process, scrubbers are used for flue gas cleaning in place of electrostatic precipitators. It is, however, more expedient to pass these vapors through the incinerator furnace for deodorization. This method, or direct injection of sewage sludge into the combustion chamber is adopted at other incinerators.

58951

APTIC NO. 82995

Rase, Howard F. and Larry A. Maddox

HYDRODESULFURIZATION OF HEAVY HYDROCARBON FEEDSTOCKS WITH NONSTOICHIOMETRIC TITANIUM CARBIDE CATALYST SUPPORT. (Assignee not given.) U. S. Pat. 3,871,998. 9p., March 18, 1975. 5 refs. (Appl. Oct. 15, 1973, 4 claims).

A process for the hydrodesulfurization of heavy hydrocarbon feedstock boiling above 650 F is described. The process utilizes Group VI-B and/or Group VIII metal, metal oxide, metal sulfide or mixtures thereof, composited with a nonstoichiometric titanium carbide support. This is the first time that nonstoichiometric titanium carbide is composited with metals and used as a catalyst. The TiC is an interstitial solid solution that possesses a stable phase over the stoichiometric range of TiC 0.52 to TiC 0.99, and preferably within a range of TiC 0.70 to TiC 0.95. By varying the stoichiometry of the TiC support within the limits described, an interaction is created between the hydrogenation-dehydrogenation component and the support, and the activity and selectivity of the reactions can be controlled and optimized. (Author abstract modified)

58954

58952

APTIC NO. 84418

Rawlings, Gary D.

AIR POLLUTION ABATEMENT AT FERTILIZER MIXING PLANTS. Preprint, American Chemical Society, Washington, D. C., 37p., 1975. 11 refs. (Presented at the American Chemical Society Meeting, Chicago, Ill., Aug. 24-29, 1975.)

Air pollution abatement at three types of fertilizer mixing plants are described: ammoniation-granulation, bulk blend, and liquid mix. Emissions include: ammonia vapor and ammonium salts, chlorine vapor and inorganic salts, fluorine compounds, phosphorus compounds, and particulates. The type of air pollution control equipment used depends on plant type, production capacity, and operating conditions and includes cyclone and wet scrubbers, spray dedusters, spray towers, electrostatic precipitators, and filters. The collection efficiencies for various types of this equipment are tabulated.

58953

APTIC NO. 83289

Ray, Frank M.

FILTER BAG ASSEMBLY FOR PULSE JET COLLECTOR. (Flex-Kleen Corp., Chicago, Ill.) U. S. Pat. 3,884,659. 4p., May 20, 1975. 8 refs. (Appl. June 3, 1974, 3 claims).

An improved filter bag assembly for pulse jet dust collector is described. The assembly includes an open ended sleeve like filter bag telescopically fitted over an open ended wire support cage and a metal end cap for closing one end of the filter bag and cage. The end cap is crimped onto the bag end in a double curl lock seam arrangement and is provided with circumferentially spaced detents which provide a mechanical interlock within the bottom end ring of the support cage to center the bag relative to the cage. The prior art filter bag has a fabric end cap stitched along a circular seam to a main fabric sleeve. This bag construction requires a costly stitching operation and is still subject to end cap wear as well as to the possibility of the bag fabric being abraded by the ends of the wire rods that extend the length of the cage. (Author abstract modified)

58954

APTIC NO. 83788

Raynal, B.

COMBUSTION ANALYSIS TECHNIQUES AND THEIR APPLICATIONS IN INTERNAL COMBUSTION ENGINES. (Les techniques d'analyse des gaz de combustion et leurs applications dans le domaine des moteurs thermiques). Text in French. Rev. Gen. Thermique (Paris), 14(162-163):475-483, June-July 1975. 23 refs.

Combustion gas analysis techniques presently in use are indispensable auxiliaries in optimizing the motor-carburetor complex in view of increasingly strict pollution and carburant consumption regulations. In most instances, the use of catalytic post-combustion apparatus is necessary to meet American pollution restrictions. To reduce carbon monoxide, hydrocarbon, and nitrogen oxide emissions to extremely low levels, a multifunctional catalyst is being investigated. Maintenance of the composition of the exhaust gases within relatively narrow limits, a factor indispensable to the efficacy of such a catalyst, can be achieved by means of a regulation system controlled by the composition of the exhaust gases. An oxygen probe can suddenly increase the stoichiometric tension which corresponds to the optimal redox characteristics of the gases for the catalyst at any temperature over about 400 C. The low response rate of the probe makes it possible to regulate fuel feedinf of the motor. The composition of the exhaust gases can also be controlled at exit from the motor by regulating the flow rate of additional air injected before the catalytic compartment. Although the efficacy of these measures has been repeatedly demonstrated, the major problem remains the endurance capacity of the probes and of the catalyst on a vehicle.

58955

APTIC NO. 79617

Record, R. G. H.

INSTRUMENTATION FOR COMBUSTION CONTROL.

Iron Steel Int., 48(3):211-217, June 1975. 5 refs.

The various methods of closed-loop combustion control in use in the major process industries are described. Typical series and parallel connected fuel/air ratio schemes for automatic combustion control are analyzed. Some attention is paid to waste gas oxygen measurement and its use in trimming the combustion ratio and to recent advances in this area. The combustion control system used on a battery of 24 soaking pits is also described as an example of effective use of currently available technology. (Author abstract modified)

58956

APTIC NO. 82031

Reed, Robert D. and Eugene C. McGill

NITROGEN OXIDE CONTROL USING STEAM-HYDROCARBON INJECTION. (*John Zink Co., Tulsa, Okla.*) U. S. Pat. 3,911,083. 4p., Oct. 7, 1975. 2 refs. (Appl. Feb. 24, 1972, 3 claims).

A device for the reduction of nitrogen oxides in waste gases under conditions which do not require careful control of the fuel burning state is described. The invention consists of a two-chambered refractory-lined furnace. Fuel gas and stoichiometric air are introduced into the first chamber to provide an ambient temperature sufficient for the reaction of steam and hydrocarbon gases which are introduced into the first chamber to provide a reducing atmosphere. The nitrogen oxide-containing gases are also introduced into the first chamber where the NO_x are reduced. The gases then pass into a second chamber where they are rapidly cooled to a temperature below that at which there is thermo-regeneration of NO_x. Additional air is supplied to the second chamber for the combustion of combustible gases remaining therein after reduction; care is taken that the temperature never rises above the temperature at which there is substantial regeneration of NO_x. (Author abstract modified)

58957

APTIC NO. 82124

Reed, Robert D.

FLARE SYSTEM VAPOR RECOVERY. (*John Zink Co., Tulsa, Okla.*) U. S. Pat. 3,915,620. 7p., Oct. 28, 1975. 4 refs. (Appl. Sept. 9, 1974, 7 claims).

A system for selectively withdrawing vapors from a flare system when the volume of flare vapors is greater than a selected minimum volume is described. Means for sensing the pressure and flow in the flare system are provided so that any vapors removed from the system for recovery and use elsewhere do not result in a condition where there is an inflow of atmospheric air into the flare stack, creating the possibility of an explosive mixture being formed within the flare system. (Author abstract modified)

58958

APTIC NO. 83153

Reed, Robert D., John Smith Zink, Robert F. Schwartz, Horst Glomm, John C. Corble, and Harold F. Koons

METHOD FOR NON-POLLUTING COMBUSTION OF WASTE GASES. (*John Zink Co., Tulsa, Okla.*) U. S. Pat. 3,887,324. 9p., June 3, 1975. 4 refs. (Appl. Oct. 15, 1973, 6 claims).

A non-polluting waste gas disposal system for processing plants or other operations subject to variable quantities of waste gas for disposal is described. The system includes a low-level burner normally adapted to handle the usual volumes of plant waste gas, without visible flame, smoke, or noise pollution. An elevated flare can be used in combination to consume gases in excess of the normal capacity of the low level flare. Prior art systems have plural burner stages which operate sequentially upon reaching a given pressure but have the disadvantage of each stage starting at zero flow and these systems do not operate efficiently and economically. (Author abstract modified)

146

58959

APTIC NO. 83154

Reese, Gerald D., Gerald G. Shank, and Lowell D. Carlson

FUEL INJECTION SYSTEM FOR TWO CYCLE ENGINE. (*Textron, Inc. Providence, R. I.*) U. S. Pat. 3,888,214. 6p., June 10, 1975. 7 refs. (Appl. June 1, 1972, 10 claims).

A low pressure fuel injection system for a two cycle internal combustion engine is described. Fuel is introduced into the combustion chamber during the intake cycle from a cavity in the wall of the combustion chamber supplied with fuel by a metering apparatus that controls the flow of fuel in accordance with engine demand. The fuel is compressibly accumulated when the cavity is covered by the piston during the compression and combustion cycles. As the piston moves into the fuel intake cycle, the cavity is opened and the fuel charge is discharged and swept out by the flow of intake air for subsequent vaporization and combustion. There is no other simple, low pressure fuel injection system available for a two cycle engine. (Author abstract modified)

58960

APTIC NO. 82560

Reese, Richard G.

SECONDARY BED FLUTRIATION ARRESTOR FOR A FLUID BED DISPOSAL METHOD AND APPARATUS. (*Combustion Power Co., Inc., Menlo Park, Calif.*) U. S. Pat. 3,882,798. 7p., May 13, 1975. 3 refs. (Appl. June 24, 1974, 5 claims).

A waste disposal apparatus for consuming waste with minimal residue and a substantially pollution free gaseous output is described. It includes a combustion housing, a bed of granular material, means for supporting the bed of granular material within the housing, means for providing combustion air to the bottom of the bed for maintaining the granular material in a fluidized state, and an obstruction of labyrinth construction positioned within the housing above the bed. The grate bars of the first and second grates are staggered to form a tortuous path through the obstruction and to prevent build-up materials which clog and disrupt the effectiveness of the labyrinth obstruction.

58961

APTIC NO. 82404

Reh, Lothar, Karl-Heinz Dorr, Hugo Grimm, and Karel Vydra

PROCESS FOR CATALYTICALLY REACTING GASES HAVING A HIGH SO₂ CONTENT USING DIFFERENT CATALYSTS. (*Metallgesellschaft Aktiengesellschaft, Frankfurt am Main (Federal Republic of Germany)*) U. S. Pat. 3,897,545. 8p., July 29, 1975. 6 refs. (Appl. March 21, 1973, 6 claims).

A process for catalytically reacting gases having a high sulfur dioxide content using different catalyst is described. The gases are catalytically reacted with oxygen in catalyst contacting trays to form sulfur dioxide. The catalyst in the first contacting tray is different from the catalyst in the second contacting tray. The feedstock gases are reacted in the first contacting tray in contact with a vanadium pentoxide based catalyst and the effluent gas from the first contacting tray is fed to a second contacting tray without interstage cooling and is reacted therein in contact with an iron based catalyst. The disadvantages of known processes are avoided by reducing the number of interstage cooling steps previously required between the contacting trays for a given total conversion and yet avoiding a deterioration of the catalysts. (Author abstract modified)

58962

APTIC NO. 83150

Reh, Lothar, Karl Vydra, Karl-Heinz Doerr, Hugo Grimm, and Karl-Heinz Hennenberger

PROCESS FOR CATALYTICALLY REACTING GASES HAVING A HIGH SULFUR DIOXIDE CONTENT. (*Metallgesellschaft Aktiengesellschaft, Frankfurt am Main and Norddeutsche Affinerie, Hamburg (Federal Republic of Germany)*) U. S. Pat. 3,875,294. 6p., April 1, 1975. 10 refs. (Appl. March 13, 1973, 10 claims).

A process for catalytically reacting gases having a high sulfur dioxide content is described. The gases are reacted with oxygen to form sulfur trioxide in the presence of catalysts in contacting trays with interstage cooling between trays. The reaction gases are in flowing contact with catalyst bodies having a closed surface wherein the ratio of the contacted catalyst surface to the contacted catalyst volume is 120-400/m and the residence time in each catalyst tray is 0.03 to 0.05 sec. Unlike other processes, this process operates without dilution with inert gases and with simple equipment and operations. (Author abstract modified)

58963

APTIC NO. 82843

Renault, Philippe, Claude Dezael, Andre Deschamps, and Sigismond Franckowiak

PROCESS FOR REMOVING SULFUR DIOXIDE AND SULFUR TRIOXIDE FROM WASTE GAS AND PRODUCING SULFUR THEREFROM. (*Institut Francais du Pétrole, des Carburants et Lubrifiants, Rueil Malmaison (France)*) U. S. Pat. 3,883,638. 5p., May 13, 1975. 7 refs. (Appl. March 15, 1973, 5 claims).

A process for removing sulfur dioxide and sulfur trioxide from waste gas to produce elemental sulfur is described. The waste gas is washed with water and ammonia, and the resulting solution of ammonium sulfites and sulfates is heated to convert the sulfites to SO₂ and ammonia. The sulfates are reacted with a reducing agent for producing additional SO₂, and all the SO₂ is reacted with hydrogen sulfide to obtain S. A flow of inert gas is passed through the intermediately formed solution of neutral ammonium sulfate to convert it to ammonium hydrogen sulfate. No other process provides for the direct production of practically pure S and the highly selective conversion of all the S-containing compounds present in the brines. (Author abstract modified)

58964

APTIC NO. 82894

Renault, Philippe, Andre Deschamps, and Claude Dezael

PROCESS FOR PURIFYING INDUSTRIAL GASES CONTAINING SULFUR DIOXIDES. (*Institut Francais du Pétrole, des Carburants et Lubrifiants, Rueil-Malmaison (France)*) U. S. Pat. 3,883,643. 7p., May 13, 1975. 4 refs. (Appl. June 6, 1972, 1 claim).

A process for purifying an industrial gas containing sulfur dioxide and oxygen and/or sulfur trioxide is described. The gas is contacted with an aqueous solution of ammonia and/or ammonium neutral sulfite. A portion of the water is vaporized and the sulfites of the resulting solution are decomposed to sulfurous anhydride and ammonia by heating. The ammonium sulfate is converted to sulfurous anhydride and ammonia and the sulfurous anhydride is reacted with hydrogen sulfide to produce sulfur which is separated. (Author abstract modified)

58965

APTIC NO. 83363

Reshidov, I. K., I. A. Kizim, Y. I. Sanaev, and V. P. Rastorguev

METHODS OF REDUCING SECONDARY DUST ENTRAINMENT IN VERTICAL ELECTROSTATIC PRECIPITATORS. (*Sposoby snizheniya vtorichnogo unosu pyli v vertikal'nykh elektrofilyakh*). Text in Russian. *Tsement*, no. 11:17-18, Nov. 1975. 2 refs.

Studies were conducted in an attempt to develop more efficient electrostatic precipitators (EP) for the purification of gases in various industries (cement, aluminum industries). The secondary entrainment during shaking in vertical EP with C-shaped electrodes at a gas flow rate close to 1 m/sec was insignificant. The use of C-shaped receiving electrodes and corona-discharge electrodes with a 70% increase in the specific sedimentation surface increased the degree of gas purification by vertical EP to 99.2-99.4%. The vertical EP with C-shaped receiving electrodes is recommended as a prototype for serial EP.

58966

APTIC NO. 82665

Realer, Edwin L., Jr.

COMBUSTION MEANS FOR A LOW POLLUTION ENGINE. (*Cornell Research Foundation, Inc., Ithaca, N. Y.*) U. S. Pat. 3,877,229. 15p., April 15, 1975. 6 refs. (Appl. Feb. 4, 1974, 38 claims).

An apparatus for burning the exhaust gases of an internal combustion engine operable in the fuel rich mode is described. In order to effect complete combustion of the hydrocarbon and carbon monoxide components without the formation of undesirable oxides of nitrogen, the combustion of the fuel-rich exhaust gases is effected by a burner operable at one atmosphere and between 2500-3000 Rankine. Combustion air is supplied to the burner by an air motor of the piston cylinder type which is driven by the crankshaft of the engine. A heat exchanger device is provided for converting the heat of the burner flame to useful mechanical energy that is returned as driving power to the engine. One or more of the cylinders of the engine may constitute the air cylinder for supplying combustion air to the burner, as well as the means for supplying combustion air to the burner, as well as the means for returning power from the burner to the output shaft of the engine. Other pollution control systems are generally quite complex and relatively expensive. They do not readily lead themselves in retrofit upon existing internal combustion engines. (Author abstract modified)

58967

APTIC NO. 82789

Reynolds, Joseph P., Louis Theodore, and James Marino

CALCULATING COLLECTION EFFICIENCIES FOR ELECTROSTATIC PRECIPITATORS. *J. Air Pollution Control Assoc.*, 25(6):610-616, June 1975. 13 refs.

A mathematical model for calculating electrostatic precipitator collection efficiencies without the aid of pilot plant or field test data is presented and applied to several industrial precipitator applications. Performance curves are generated which describe the predicted collection efficiency as a function of precipitator length, plate-to-plate spacing, and average field strength. Collection efficiency is also shown to be sensitive to particle size distribution, a complication that cannot be easily treated by the conventional Deutsch-Anderson equation. Reasonable agreement is obtained between collection efficiencies predicted by the model and those based on actual precipitator performance. (Author abstract modified)

58968

APTIC NO. 82158

Rich, Robert E.

MULTI-BORE INTAKE MANIFOLD WITH IMPROVED FUEL DISTRIBUTION. (*General Motors Corp., Detroit, Mich.*) U. S. Pat. 3,915,128. 4p., Oct. 28, 1975. 6 refs. (Appl. Sept. 16, 1974, 4 claims).

A multi-bore intake manifold for a V-type internal combustion engine with a four barrel carburetor is described which results in improved fuel distribution and more efficient exhaust gas recirculation for the reduction of nitrogen oxides. Several feed conduits connect the manifold chamber with the engine intake ports. The primary bores of the manifold are open to the secondary bores but are cut off at the bottom from direct communication with the manifold chamber by primary floors. This forces all fuel from the primary and secondary bores to enter the manifold chamber through the secondary bores for consistent fuel distribution among the cylinders under all engine operating conditions. The primary floors also improve the mixing of exhaust gases from an exhaust gas recirculation conduit which normally opens to the primary bores. The exhaust gases from this conduit have a longer path in which to mix with the fuel mixture before entering the manifold chamber, and the mixing is enhanced by turbulence as the mixture moves into the secondary bore. (Author abstract modified)

58969

APTIC NO. 81003

Rigo, H. G., S. A. Hathaway, and F. C. Hildebrand

PREPARATION AND USE OF REFUSE DERIVED FUELS IN INDUSTRIAL SCALE APPLICATIONS.

Systems Technology Corp., Dayton, Ohio, Construction Engineering Research Lab., Champaign, Ill., and Naval Facilities Engineering Command, Alexandria, Va., *Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 22-27. (Nov. 3-5.)*

Engineering data and criteria from feasibility studies and tests of 14 military and 3 civilian locations covering the preparation and use of refuse as fuel in package incinerator - boiler combinations and boilers smaller than 10 MW are presented. Small systems are not only technically feasible, but economically desirable. Environmental protection during the preparation of refuse derived fuels (RDF) in industrial scale applications is discussed. There is need for dust control for shredders and air classifiers whose off gases contain up to 0.05% of the feed as entrained dust. The sterilizer is a potential hazard. If plated metals are not removed prior to introduction into the sterilizer, high concentrations of zinc, tin, cadmium, lead, and antimony can be emitted as a submicron heavy metal aerosol, formed by the reduction and evaporation of metal in the fuel bed and the oxidation of the vapor as it passes through the flame front. Odors are readily controlled by taking the combustion air for the sterilizer from the refuse receiving area. A greater fraction of the ash than is found in conventional boilers is entrained in the combustion products. A high mass emission rate is expected. High efficiency fine particulate collection is required, using either electrostatic precipitators, scrubbers, or bag houses.

58970

APTIC NO. 76148

Rinker, Thomas L.

TREATMENT OF TEXTILE WASTEWATER BY ACTIVATED SLUDGE AND ALUM COAGULATION (FINAL REPORT). *Lehigh Valley Industries, Inc., Pangor, Pa., Blue Ridge-Winkler Textiles Div., Environmental Protection Agency Grant S801192, Program Element 1BB036, ROAP 21AZT-006, Rept. EPA-600/2-75-055, 216p., Oct. 1975. 15 refs.*

Results of a study of the treatment of wastewater from a textile mill producing synthetic knit fabric for the apparel and automotive markets with a system combining biological (activated sludge) and chemical (alum coagulation) processes are given. The treatment consists of heat recovery; equalization; completely mixed activated sludge with sedimentation and nutrient supplement; and alum coagulation with sedimentation, polymer addition, and pH adjustment. The activated sludge process effectively removes degradable organics and ammonia nitrogen. The alum coagulation process effectively removes colloidal organics, suspended solids, orthophosphate, and certain metals. Total treatment system removals for BOD (biological oxygen demand), COD (chemical oxygen demand), and color were 92, 73, and 69%, respectively. Capital cost of the system was \$1.15 million with a yearly operating expense of \$269,030, including capital cost depreciation. Additional treatment was required to meet anticipated discharge limitations. Appropriate research studies were conducted using carbon adsorption, resin adsorption, and ozonation for residual soluble color removal. (Author abstract)

58971

APTIC NO. 76239

Roberts, G. W.

WHAT'S THE FUTURE FOR AUTOMOTIVE EMISSION CONTROL? *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975. p. 212-233. 2 refs. (Feb. 17-21.)*

Prospects for increased automotive emission control are discussed along with control measures incorporated by General Motors on Australian automobiles. All Holdens in Australia were equipped in 1967 with a positive crankcase ven-

tilation system, providing a 19% reduction in hydrocarbon emissions. Modifications and adjustments to carburetors were made in the latter part of 1971 to meet the Australian Design Rule (ADR) 26 for a 4.5% maximum carbon monoxide content at idle. This reduced CO emissions by 15%. Carburetor and engine modifications were made late in 1973 to meet the current ADR 27 specification. Further carburetion and engine modifications scheduled to become effective in 1976 are expected to reduce carbon monoxide, hydrocarbon, and nitrogen oxide emissions by 69, 80, and 38%, respectively.

58972

APTIC NO. 83579

Robinson, James V. and Larry O. Hill

METHOD OF DEODORIZING ANIMAL WASTES. *(The Mead Corp., Dayton, Ohio) U. S. Pat. 3,884,804. 8p., May 20, 1975. 3 refs. (Appl. June 29, 1973, 13 claims.)*

A method of treating animal wastes to reduce odors produced by the decomposition of organic materials is discussed. Contacogen particles, comprising solid catalyst particles having surface portions which are wetproofed by treatment with a hydrophobic material, are floated on the surface of a watery mass containing animal wastes. The Contacogen particles promote the oxidation by air of the odoriferous compounds produced by the degenerative breakdown of animal wastes. The Contacogen particles are self-renewing in that a portion is continually at the air interface where the oxidation takes place. Livestock manure or human sewage is treated in this manner wherever present in a contained, open-air watery mass. Unlike other processes, this process is continuous in that the partially wetproofed catalyst particles utilized to promote the oxidation of the odoriferous compounds are self-renewing. (Author abstract modified)

58973

APTIC NO. 82085

Robison, James Ray

METHOD FOR CONTROLLING A CLAUS PROCESS. *(International Telephone and Telegraph Corp., New York) U. S. Pat. 3,904,370. 12p., Sept. 9, 1975. 7 refs. (Appl. Aug. 12, 1974, 3 claims.)*

An improved Claus process control system that utilizes two coulometric titrators for automatically controlling the amount of oxygen used in burning a portion of the hydrogen sulfide in flue gases is described. Scrubbed and unscrubbed samples of the flue gases downstream of the oxygen injection point are fed to the titrators which produce hydrogen sulfide and sulfur dioxide plus hydrogen sulfide analog output signals which are used to control the rate of oxygen flow or air injected. This control assures that the flue gases contain hydrogen sulfide at a concentration which is equal to twice the concentration of the sulfur dioxide therein. (Author abstract modified)

58974

APTIC NO. 76196

Robson, F. L., A. J. Giramonti, W. A. Blecher, and Gerald Mazzella

FUEL GAS ENVIRONMENTAL IMPACT: PHASE REPORT. *United Technologies Research Center, East Hartford, Conn., and Foster Wheeler Energy Corp., Livingston, N. J., Environmental Protection Agency Contract 68-02 1099, ROAP 21ADD-027 and -104, Program Element 1AB013, Rept. EPA-600/2-75-078, 314p., Nov. 1975. 85 refs.*

Results of an evaluation of the technical and economic feasibility of: Lurgi-type fixed bed gasifiers and BCR-type entrained flow gasifiers in combination with low- and high-temperature fuel gas cleanup systems; advanced technology combined-cycle power systems; and integrated gasification systems, cleanup processes, and power systems are presented. Processes and systems considered where those using technology both currently available for power station configurations which the contractor judged could appear in commercial applications in the 1975-1978 time frame (first generation systems) and potentially applicable in the 1980-decade time period

CONTROL METHODS

58980

(second generation systems). High-temperature cleanup systems have the potential of improving the efficiency and reducing the capital costs of integrated gasification systems. (Author abstract)

58975

APTIC NO. 82428

Roeser, Helmut, Herbert Voelker, and Hans-Dieter Brand

APPARATUS FOR THE PURIFICATION OF WASTE GASES FROM INTERNAL COMBUSTION ENGINES. (Decatex, GmbH, Frankfurt (Federal Republic of Germany)) U. S. Pat. 3,892,536. 6p., July 1, 1975. 11 refs. (Appl. Nov. 26, 1973, 13 claims).

An apparatus for the cleaning of exhaust gases of diesel engines of motor vehicles and of stationary installations is described. It prolongs the useful life of the catalyst by cushioning the harmful vibrations and prevents the temporary phase inactivation of the catalyst surface connected with the cold start phase. The apparatus acts to stabilize the pulsating exhaust gases in an antechamber and in the cold phase to absorb particles of carbon black as well as condensing components of the exhaust gases and arranging the catalyst unit in an oscillation or vibration dampened suspension. The components of the exhaust gas collected in the cold phase in the antechamber are transferred gradually with increased heating into the catalyst space and there are rendered harmless. The conveyance of the separated carbon black is effected at the same time by the warm exhaust gas and the evaporating condensate.

58976

APTIC NO. 82014

Rosenlund, Iver Theodore

EXHAUST GAS REACTOR SUPPORTING PINS. (Du Pont de Nemours (E. I.) and Co., Wilmington, Del.) U. S. Pat. 3,904,374. 4p., Sept. 9, 1975. 6 refs. (Appl. Feb. 14, 1973, 1 claim).

An elongated automobile exhaust gas reactor with a specially designed supporting pins to reduce thermal stress is described. An elongated reactor chamber is mounted within a surrounding shell by supporting pins that are aligned axially and connect the chamber to the shell at their ends. The pins can be wholly or partially hollow to serve as gas inlets providing communication between the reactor chamber interior and the reactor shell exterior. The pins fit into the reactor chamber such that the chamber has freedom to slide along the pins. (Author summary modified)

58977

APTIC NO. 76509

Rosenwald, Robert H., Robert J. J. Hamblin, Peter Urban, and Robert P. Zimmerman

SULFIDE OXIDATION: SULFOX SYSTEM OF POLLUTION CONTROL. *Ind. Eng. Chem. Prod. Res. Develop.*, 14(4):218-226, Dec. 1975. 36 refs.

Results of a study of the conversion of ammoniacal solutions of hydrogen sulfide to elemental sulfur by oxidation with atmospheric oxygen are reported. The effect of temperature, oxygen supply, catalyst, and a system of two stage oxidation were studied in relation to the yields of sulfur and by-products. Preliminary study was made with bench top investigation followed by continuous flow experimentation. Catalyst studies considered the effect of carbon, metal sulfide, and metal complexes. Oxidation at temperatures that produce molten sulfur gave varying fields of sulfur and water soluble products. A more efficient method was to oxidize a substantial portion of the sulfide under mild conditions to a polysulfide solution followed by liberation of sulfur either by oxidizing the remaining sulfide under more severe conditions or by steam stripping the solution. (Author abstract)

58978

APTIC NO. 80302

Ross, Fraser

TO SCRUB OR NOT TO SCRUB? *Public Util. Fortn.*, 96(10):33-37, Nov. 6, 1975. 15 refs.

The need for further reductions in sulfur dioxide emissions in the United States and Great Britain is discussed. No further control measures are needed. Health statistics in New York City indicate that the SO₂ standards should be either greatly relaxed or abandoned entirely. Flue gas scrubbing for large plants has no relevance to high concentrations in cities. Widespread application might reduce rural concentrations to the detriment of crop yields. A case for flue gas desulfurization based on sulfates is misconceived if the observed effects are due to metal compounds. If it is genuinely desired to reduce sulfate, most of the processes with some promise of being practicable are excluded because they will increase sulfates. The only case for flue gas desulfurization must be based on acid rain. A quantitative assessment for acid rain is under study, but it is unlikely to justify year-round sulfur emission reduction as a cure for an acidity problem confined to a narrow range of the compass. (Author conclusions)

58979

APTIC NO. 83821

Rostek, H. A., P. Hofbauer, and G. Wilmers

FUEL SAVINGS AT CONVENTIONAL WARM WATER HEATING PLANTS BY GAS-OPERATED COMPRESSION HEAT PUMPS. (*Brennstoffeinsparung bei konventionellen Warmwasserheizungsanlagen durch gasbetriebene Krompressions-Waermepumpen*). Text in German. VDI (Ver. Deut. Ingr.) Ber., (250):171-178, 1975. 8 refs.

Energy saving by means of gas-powered compression-heat pumping systems in room heating is discussed. It was established that these pumps, depending on motor efficiency, can reach heating outputs of 161-185% in relation to the heat content of the gas. Their primary advantage is based on the fact that the heating gas was converted at the consumption site into heat or mechanical energy by combustion and utilized at a total yield of about 86% while the electrically powered heating pump displays a loss of about 73% (only 27% of primary energy available). Utilization of waste heat in the gas pump made it possible to use lower condensation temperatures for the working medium whereby the output coefficient, e.g., ratio of environmental heat to the disposable mechanical energy, was improved. It was expected that gas pumps would work satisfactorily even at outside air temperatures below 0 C as opposed to electric pumps which would no longer be economical at these temperatures. Therefore, employment of the former pumping system, even at twice the investment cost for conventional boilers, would result in an average 50% energy saving. It would still be useful, although less so, in small installations for 1 or 2-family houses. Since the outside air would be used as a source of heat for gas-powered heating pumps, application of this new heating system, preferably in densely populated areas, would significantly reduce heat pollution of the environment. Moreover, pollution would be lowered by half as compared to fossil-fired boiler systems of equal heating efficiency due to the fact that 50% of the necessary heat would be obtained from the environment. This program involved development of a natural gas-powered rotational piston-heating pump and a lifting-cylinder heating pump.

58980

APTIC NO. 82991

Roth, James F., James W. Gambell, and Charles R. Penquite

SHRINKAGE RESISTANT AUTO EXHAUST CATALYSTS. (Monsanto Co., St. Louis, Mo.) U. S. Pat. 3,883,445. 15p., May 13, 1975. 2 refs. (Appl. Aug. 23, 1973, 22 claims).

Novel oxidation catalysts for removing carbon monoxide and hydrocarbons from the exhaust of automotive engines are described. In comparison with other catalysts, they have a high conversion efficiency coupled with unusual resistance to volume shrinkage and weakening of the catalyst composite after exposure to high temperatures. The catalysts consist of an alumina support and specified amounts of copper, chromium, and specified rare earth compounds. (Author abstract modified)

58981

APTIC NO. 82003

Rottmayr, Friedrich, Hans Reimann, Robert Schuster, Walter Wagner, and Hans Joachim Muller

PREVENTION OF RESIN FORMATION DURING ABSORPTION OF CO₂ AND/OR H₂S FROM CRACKING GASES.

(Linde Aktiengesellschaft; Erdolchemie Gesellschaft mit beschränkter Haftung, Cologne-Worringen (West Germany)) U. S. Pat. 3,911,082. 12p., Oct. 7, 1975. 3 refs. (Appl. Nov. 24, 1972, 9 claims).

An alkaline scrubbing process for the treatment of cracking gas containing carbon dioxide, hydrogen sulfide, and resin precursors is described which reduces resin accumulation during the regenerating step. The improvement consists of passing a liquid dispersion of a water-immiscible organic solvent and an aqueous solution of potassium carbonate, alkanolamine, or an aminocarboxylic, aminosulfonic, or aminocarbonic acid salt through scrubbing and regenerating columns to separate and remove the resin precursors from the loaded aqueous solution during thermal regeneration by preferential extraction of the resin precursors into the organic solvent.

58982

APTIC NO. 83739

Rueb, Friedmund

THERMAL AND CATALYTIC INCINERATION OF TOXIC WASTE GAS COMPONENTS. (Thermische und katalytische Verbrennung Schädlicher Abgasbestandteile). Text in German. Wasser Luft Betrieb, 19(12):702-708, 1975.

Several applications of thermal and catalytic incineration are illustrated and described. A thermal combustion unit uses oil or gas as a fuel. It requires extensive mixing of combustion gases and waste gases, and this may be accomplished by passing the waste gases through the flame. Carbon monoxide and organic compounds are readily oxidized at 680-800 C. The method is applicable to treating gases from a lacquer drying oven, where solvent concentration is 300-5000 mg/cu m. The catalytic combustion apparatus is similar to that for thermal combustion except for a chamber containing an oxidation catalyst of large surface area. The catalytic method can be used only when catalyst poisons, such as organic phosphorus compounds, silicones, heavy metals, sulfur and chlorine, are absent. For a waste gas from a fish meal dryer, with volume flow of 33,000 cu m/hr, reaction takes place at 420 C, after which gases are blown into the atmosphere at 280 C. The catalytic oxidation unit will also purify diesel motor exhaust gas. The CO and hydrocarbons are oxidized by the catalyst, but soot is only partially burned. Fuel use is greater in the thermal combustion method, but the initial cost for catalytic equipment is much higher. The Adsox process is used where an organic vapor is present in gases at low concentration (5 g/cu m or less). Active carbon absorbs the organic vapor from the exhaust gases. This material is then removed from the active C by a much smaller amount of hot gas, and is burned in a thermal combustion unit.

58983

APTIC NO. 84361

Ruggeri, Sam

STACK GAS SCRUBBING - THE CON VIEWPOINT. Air Pollution Control Assoc., Pittsburgh, Pa., Mid-Atlantic States Section, Air Pollution Control Assoc. Semi-Annu. Tech. Conf. Proc. Sulfur Fuels - Problems Alternative Solutions, Wilmington, Del., 1975, p. 95-113. (April 25.)

A critical review of using stack gas scrubbing for the control of sulfur dioxide from steam electric plants is presented. Stack gas scrubbing is seen as resulting in an overall loss of system reliability and the creation of an overwhelming waste disposal problem. This control approach is also criticized as being inflationary. Coal conversion or preparation techniques are viewed as being less undesirable alternatives. Reducing the amount of high sulfur fuel burned when conditions require it is suggested as the most efficient way of meeting the ambient air standards for SO₂.

58984

APTIC NO. 82084

Ryan, John J.

STRATIFIED CHARGE SYSTEM. (Assignee not given.) U. S. Pat. 3,905,343. 5p., Sept. 16, 1975. 11 refs. (Appl. Sept. 21, 1973, 2 claims).

A stratified charge system for the reduction of exhaust emissions from internal combustion engines is described which does not require alterations of major engine components. The system consists of a fuel and air metering unit mounted on a precombustion chamber which in turn is mounted in the spark plug hole of the engine's cylinder head. The spark plug is mounted on the outer end of the precombustion chamber, and the unit is provided with a mixing passage which is connected to a fuel source and a source of air. The unit provides the rich portion of the charge to the cylinder, while the lean portion of the charge to the cylinder is introduced from the carburetor. The unit also can be used in conjunction with a fuel injection engine. (Author abstract modified)

58985

APTIC NO. 83229

Rychkov, V. P., B. P. Volgin, and A. P. Khaymenov

EFFECT OF FREE RADICALS ON THE GAS CLEANING PROCESS WITH ELECTROSTATIC PRECIPITATORS. (Vliyaniye svobodnykh radikalov na protsess elektrozoochistki). Text in Russian. Ogneupory (USSR), vol. 9:32-35, 1975. 12 refs.

Theoretical studies show the formation of the negative space charge during electrical gas discharges to be phenomena of the homolytic decomposition of molecules of gas and side mixtures into free radicals and the adsorption of free electrons by free radicals. To intensify the work of electric filters, conditioning admixtures prone to the formation of free radicals are the most realistic. Such admixtures include cyclohexane, carbon tetrachloride, carbon bisulfide, ethyl acetate, benzene, chloroform, ether, acetic acid, diisooamylamine, heptane, methane, thiophene, and many other substances with a dissociation energy not exceeding that of some electronvolts.

58986

APTIC NO. 76510

Rymarz, Ted M. and David H. Klipstein

REMOVING PARTICULATES FROM GASES. Chem. Eng./Deskbook, vol. 1975:113-120, Oct. 6, 1975.

Equipment for removing particulates from gas streams before the gases are discharged into the atmosphere is reviewed. Particulate collectors are classified as mechanical collectors, wet scrubbers, fabric filters, and electrostatic precipitators. Some collectors combine the operating principles of two classes and some also remove some gaseous pollutants. A particulate collector may include a secondary function such as gas cooling. Application of a given collector to a specific particulate source is subject to change because of evolution both in collection technology and collection requirements. Precise evaluation of a collector for a specific application requires knowing both the distribution by weight of particle sizes in the gas stream and the collector's efficiency for each size fraction. Single particle size and efficiency figures are included for the collectors.

58987

APTIC NO. 82523

Ryska, Josef, Jiri Frkal, Eduard Kolos, Bretislav Panak, Lubomir Vagner, and Miroslav Pospisil

CATALYST CARRIER IN PARTICULAR FOR APPLICATIONS FOR REMOVING CARBON MONOXIDE FROM EXHAUST GASES OF INTERNAL COMBUSTION ENGINES. (Ostravsko-karvinske doly, oborove reditelstvi, Ostrava (Czechoslovakia)) U. S. Pat. 3,893,952. 5p., July 8, 1975. 3 refs. (Appl. Nov. 14, 1972, 6 claims).

A catalyst carrier for removing carbon monoxide from exhaust gases of internal combustion engines is described. It consists of heat resisting bodies of cylindrical formation, each provided with one or more through-going internal channels. The outer as

well as the inner surface of the body is porous, consisting preferably of a ceramic mass, and all surfaces are coated with a firmly adhering catalyst. The bodies with applied catalyst are loosely piled up in a chamber within a filter or exhaust silencer. This carrier eliminates problems associated with all known carriers which reduce the performance of the engines due to the considerable resistance which they offer to the discharge of exhaust gases. (Author abstract modified)

58988

APTIC NO. 76479

Saintsbury, J. A. and P. Sampath

ATMOSPHERIC TESTS OF A VARIABLE COMBUSTION GEOMETRY FOR REDUCING GAS TURBINE EMISSIONS. *J. Fluids Eng.*, 97(3):321-333, Sept. 1975. 1 ref. (Presented at the Joint Fluids Engineering and CSME Conference Combustion Symposium, Montreal, Canada, May 13-15, 1974.)

The potential of variable combustor geometry for reducing emissions from an annular reverse flow gas turbine combustor was evaluated. This approach has potential if the combustor is specially developed for low emissions. The fluid dynamics of this concept were investigated in a model using flow visualization techniques. The hot tests under this program were carried out at atmospheric pressure with full simulation of combustor flows. Significant reductions in emissions and corresponding improvements in combustion efficiency are observed when a baffle is incorporated in the combustion system. (Author abstract modified)

58989

APTIC NO. 83693

Saito, Hatsuo, Yoshiya Shiiki, and Masaaki Nakao

MANUFACTURING METHOD FOR ACTIVATED CARBON. (*Kasseitan no seizo hoho*). Text in Japanese. (Kureha Chemical Industry Co., Ltd., and Toyobo Co. Ltd. (Japan)) Japan. Pat. Sho 50-39636. Sp., Dec. 18, 1975. (Appl. May 29, 1973, 1 claim).

A manufacturing method for highly efficient activated carbon using pitch as the raw material is described. The object of this process is to provide suitable active carbon for use in stack gas desulfurization processes. The activated carbon obtained by this method is an improvement over the conventionally manufactured, inefficient type, which has poor mechanical strength. A mixture of a naphthalene (10-50 parts) and pitch (100 parts) is first prepared. Then organic compounds containing high molecular nitrogen are added to the mixture in certain proportions so that the nitrogen content of the total mixture is 2 to 60 wt%. The mixture is then melted, mixed, and pulverized, naphthalene is removed by solvent, and the mixture is shaped into micro-porous particles. After this treatment, the particles are activated by steam or carbon dioxide at 800-1000 C. The characteristic of this process is the use of organic compounds containing high molecular nitrogen, and the production of bead-form activated carbon which is highly efficient, mechanically strong, and suited for use in stack gas desulfurization.

58990

APTIC NO. 79989

Saito, M.

COMPLEXATION ABSORPTION-REDUCTION METHOD: SIMULTANEOUS NOX AND SOX REMOVAL FROM FLUE GAS. (*Sakutai kyushu kangen-ho; haienchu no NOx oyobi SOx no doji jokyo*). Text in Japanese. Kankyo Sozo (*Environ. Creation*), 5(9):71, Sept. 1975. 3 refs.

A flue gas denitrification process using a complexation absorption and reduction method is described. The method uses a ferrous ion-ethylenediamine tetracetic acid system whose solution absorbs nitric oxide as the result of the formation of a ferrous complex with NO. The complexation occurs rapidly from a neutral solution, and in the presence of sulfite ion. The pH adjustment of the absorption liquid is made with sodium hydroxide or ammonia. The sulfur oxides could also be absorbed by the same liquid. The absorbed SOx exists as sulfite

ion in the absorption liquid, which increases the NOx removal. The life of the absorption liquid is short because of the oxidation of ferrous ion to ferric ion by oxygen during the absorption process; it could be extended by removing some of the absorption liquid. The ferric ion is reduced to ferrous ion by the electrolytic reduction method, for the regeneration of the absorption liquid. By using this method, the continuous removal of NOx and SOx in flue gases is possible. When the system was applied to the flue gas from a heavy oil combustion boiler whose flue gas composition was 500 ppm SOx, 320 ppm NOx, 12% water, 3% oxygen, 10% carbon dioxide, 0.104 g/N cu m soot and dust, and the balance nitrogen, the denitrification efficiency was 90%, with an absorption liquid to flue gas volume ratio of 35 l/N cu m. Most of the SOx in the flue gas was removed.

58991

APTIC NO. 82174

Saito, Takeshi

SOME PROBLEMS FROM LEAD-FREE GASOLINE.

Text in Japanese. *Nenryo Kyokaiishi (J. Fuel Soc. Japan) (Tokyo)*, 54(8):653-660, 1975. 11 refs.

Distribution of lead-free gasoline in Japan was begun in February 1975. Leaded gasoline is also sold for older cars. The need for lead-free gasoline for 1975 automobile emission legislation and some problems involved with its acceptance are discussed. Catalyst deactivation by trace lead from contaminations, motor octane number of high aromatic fuel and road octane requirement increase, and influence of fuel composition on the exhaust emission are described; and the future ideal fuel is considered. (Author abstract)

58992

APTIC NO. 83679

Sakai, Toshiyuki, Shigehiko Kobayashi, Kazuhide Miyazaki, and Michiaki Yamamoto

CATALYSTS FOR THE CLEANING OF DISCHARGED GASES CONTAINING CARBON MONOXIDE. (*Issanka tanso o fukumu haigasus no jokayo shokubai*). Text in Japanese. (Mitsui Mining and Smelting Co., Ltd. (Japan)) Japan. Pat. Sho 50-15757. 4p., June 7, 1975. 1 ref. (Appl. Sept. 29, 1970, 1 claim).

Catalysts which are prepared by adding iron or copper powder to a mixture of manganese oxide and bismuth oxide are described. A mixture of 80% by weight manganese oxide and 20% bismuth oxide was prepared. To this mixture, 20% copper powder or 60% iron powder was added. When a discharged gas (carbon monoxide 5%, oxygen, 5%, nitrogen 78%, carbon dioxide 9%, hydrocarbon 500 ppm and the rest 3%) was passed through a pipe filled with the catalysts, the CO content in the gas discharged from the pipe was 0 for up to 200 hr. The flow rate of the gas through the pipe was 100 l/min. The inner diameter of the pipe was 50 mm. Pellets of silicon carbide 4 mm in diameter and 4 mm thick were coated with the catalyst using an adhesive, dried, and baked at 400 - 500 C. The 250 g pellets filled the pipe in such a way that they gave little resistance to the passage of discharged gas. The temperature of the gas was kept at 300-500 C. The CO content of the gas coming out of this tube was as small as 0.2 - 0.3% even after 400 hr, whereas the CO content of the same gas was as high as 1.0% after 10 hr of passage when a conventional catalyst was used.

58993

APTIC NO. 83479

Sakuraba, K.

EXAMPLES OF NOX SUPPRESSION SYSTEM IN BOILERS IN OIL REFINERIES. (*Seiyusho boira ni okeru NOx yokusei sisutemu no jishirei*). Text in Japanese. Kankyo Sozo (*Environ. Creation*), 5(6):51-53, June 1975.

A combustion technique that suppresses the formation of nitrogen oxides is described. The suppression of thermal NOx can be effected by the reduction of the oxygen concentration in the combustion zone, the lowering of the maximum flame

temperature, or the reduction of the residence time of the gases in a high temperature zone. For these purposes, operation of boilers with minimized excess air, the improvement of the operation of air-resistors, 2-stage combustion, and recirculation of discharged gas are useful. The addition of water to fuel prior to combustion, the blowing of steam into the combustion zone, and changes of fuel injection distribution at the burner tips are also discussed. A boiler made by the Babcock-Hitachi Co., Ltd., was modified for the purpose of reducing the NOx discharge. The air-resistor was remodeled and 2-stage combustion and steam ejection burner tips were adopted. The maximum rated load of the boiler was 330,000 kcal/cu m/hr. The NOx concentration in the discharged gas was 430 ppm before the remodeling and 170 ppm after. The oil used was CFO.

58994

APTIC NO. 79600

Sakurai, Hideyuki

GLASS FIBER EXCHANGING DEVICE OF MUFFLER FOR AUTOMOBILE EXHAUST GAS PURIFICATION.

(Jidosha no haiki o seijoka suru mafura no gurasufaiba koken sochi). Text in Japanese. (Assignee not given.) Japan. Model Util. Sho 50-20181. 3p., June 19, 1975. 2 refs. (Appl. Jan. 22, 1970, 1 claim).

A cylindrical, fiber glass exchanging device for use in a muffler is described. A cylinder covered with metal nets at both ends was filled with fiber glass mixed with a large quantity of activated carbon powder. The detachable cylinder was attached to a muffler by screwing it to the exhaust gas inlet pipe. The pressurized, high-temperature exhaust gas was led into the muffler where expansion of the gas was allowed to occur slowly to prevent noise. The harmful gases in the exhaust were removed by the activated carbon-containing fiber glass. The cylinder is replaced when the performance of the activated carbon-containing fiber glass deteriorates.

58995

APTIC NO. 83607

Sakurai, Toshi

ENGINE INTAKE AND EXHAUST APPARATUS.

(Honda Giken Kogyo Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,884,202. 4p., May 20, 1975. 10 refs. (Appl. June 22, 1973, 2 claims).

An internal combustion engine is described which has a main and auxiliary combustion chamber, a main and auxiliary carburetor, and a main and auxiliary intake pipe providing communication between the respective carburetors and the chambers. The chambers are connected by a torch nozzle and an exhaust pipe is positioned in communication with the main combustion chamber. The main and auxiliary intake pipes and the exhaust pipes are integrally formed and positioned on the same side of the engine. A casing located about the pipes aids in the heating of the air-fuel mixture and provides protection to the intake exhaust apparatus. (Author abstract modified)

58996

APTIC NO. 84173

Sale, Bernard and Yves Breelle

NEW PROPULSION SYSTEMS ENVISAGED FOR URBAN VEHICLES. (Les nouveaux systemes de propulsion envisageables pour les vehicules urbains). Text in French. Ingrs. Automobile (Paris), no. 3-4:90-96, March-April 1975. 11 refs.

Thermomechanical propulsion systems have the advantage of a high power mass and a significant energy mass due to the energy content of light hydrocarbons. Attempts are being made to adapt classical explosion motors to new environmental and economic demands; already, emissions have been significantly reduced by adapting new combustion modes or by using catalytic processes. Other thermomechanical converters include the Stirling motor, which combines the advantages of a higher output with reduced pollution, and the vapor motor, which is handicapped by low output and power. Electrochemical systems are of major interest since they eliminate pollution and noise. The main problem concerns storage of electric energy.

gy. Although much has been achieved with classical solutions (lead accumulators), an increase in energy mass seems to be indispensable. Research is focusing on new electrochemical generators, such as the sodium-sulfur accumulator, zinc-air batteries, and hydrogen-air batteries which are of notable interest as nuclear energy takes on a more important role and as electricity storage modes are improved.

58997

APTIC NO. 82024

Saleem, Abdus and Robert Kopita

HIGH VELOCITY SPRAY SCRUBBER. (Peabody Engineering Corp., Stamford, Conn.) U. S. Pat. 3,907,526. 8p., Sept. 23, 1975. 8 refs. (Appl. April 30, 1973, 6 claims).

A high velocity limestone scrubber designed for the removal of sulfur dioxide from waste gases is described that eliminates the escape of entrained fine droplets and dust particles associated with prior art devices. The flue gas is directed in an upward direction through the scrubber, while the scrubber liquor is sprayed downwardly from at least four vertically spaced spray heads. The relative velocity between the scrubber liquor and the gas is at least 600 ft/min. Provision is made for the removal of entrained liquor droplets and dust particles from the scrubber flue gas at a location above the uppermost spray head. This may be accomplished, for example, by a wash tray having clear water passing over its top and a spray head. Alternatively, the scrubber may be widened above the scrubber space to slow the velocity of the flue gas, thus causing entrained liquor droplets and dust particles to fall out of the gas. In this latter embodiment, water sprays may be directed at the widened portion of the scrubber tower to prevent the formation of deposits. A mist eliminator is situated between the liquor droplet and dust removal means and the outlet of the scrubber.

58998

APTIC NO. 83822

Sander, U. and H. W. Schmidt

TECHNOLOGICAL DEVELOPMENT OF CHEMICAL PROCESSES FOR BETTER USE OF ENERGY.

(Verfahrenstechnische Entwicklung chemischer Prozesse unter dem Aspekt hoeherer Energienutzung). Text in German. VDI (Ver. Deut. Ingr.) Ber., (250):103-113, 1975. 16 refs.

The potential for efficient energy utilization exemplified by different chemical processes, such as sulfuric acid production, alumina calcination, and recovery of valuable metal residues, was discussed. In H₂SO₄ manufacture, the generated high-pressure steam of 41 atm could be used for direct operation of the main blower or generation of electricity. Further energy gain could be secured by heat absorption of the circulating absorbing acid whose temperature would be raised by 30-60 C. Energy recovery would be ascertained by heat exchangers. In waste acid reconcentration plants, concentrators functionally comparable with multi-phase gas washers, led to a substantial reduction of H₂SO₄-end gas contents. In alumina calcination, utilization of waste gas and production heat could lower heat consumption of Al₂O₃ calcination to 920 kcal/kg of Al₂O₃ at high capacity, but the process is very expensive and requires much space. An especially developed system involving expanded vorticity layers permits reactions with fine-grained solids at high gas speeds. In a posteriorly connected cyclone, gas and solids are separated and the solid recirculated in the reactor. This type of reactor is useful insofar as large gas streams can penetrate fairly small cross-sections of the reactor at nearly constant temperature whereby radiation losses are kept at a minimum. The principle of smelting cyclone firing, especially of the horizontal cyclone for metallurgical high-temperature reactions, was transferred from power station technology. The smelting cyclone is efficient because it permits minute distribution and a large particle surface for smelting in the gas stream resulting in a high sublimation rate of evaporating metal compounds and thus their separation. The output of the total heat recovery in metallurgical high-tempera-

ture reactors corresponds to the value of conventional smelting cyclone firings minus the heat portion discharged with the fluid smelt. In the restort residue of the NJ Zinc Process, carbon amounted to about 50%, ferric oxide 19.5%, zinc 5.72%, silica 9.5%, alumina 5.04% and silver 192 g/ton.

58999

APTIC NO. 82895

Santiago, Andres and Enrique Santiago

REACTOR CONTAINING A RESILIENTLY SUPPORTED CATALYST CARRIER BODY FOR THE DETOXIFICATION OF EXHAUST GASES OF INTERNAL COMBUSTION ENGINES. (Zeuna-Staerker KG, Augsburg (Federal Republic of Germany)) U. S. Pat. 3,876,384. 5p., April 8, 1975. 11 refs. (Appl. March 19, 1973, 6 claims).

A catalyst carrier body for the detoxification of exhaust gases of internal combustion engines is described. The monolithic catalyst carrier body is resiliently mounted in a reactor casing by surrounding the body with a protective jacket. It has a highly heat resistant steel reinforcing means embedded in a ceramic fiber and binder. The binder has a fireproof mortar. A heat resistant steel wire mesh or mat is embedded between two mats of heat resistant mortar and mineral fibers. Other carrier bodies are rather stiff and cause difficulties in mounting the catalyst carrier body in its housing because the wire webbing hinders the insertion of the carrier into the housing since the webbing is located in the narrow ring gap between the outer surface of the carrier body proper and the inner surface of the housing. (Author abstract modified)

59000

APTIC NO. 82930

Sargent, Charles L. and John A. Hoffman

WASTE DISPOSAL SYSTEM AND METHOD. (Thermasan Corp., Ann Arbor, Mich.) U. S. Pat. 3,882,799. 9p., May 13, 1975. 5 refs. (Appl. May 31, 1973, 6 claims).

An apparatus and method for disposing of liquid and organic waste material through the exhaust system of an engine is described. The waste material is collected in a holding tank from which it is metered by a pump into the exhaust gases from the engine only under controlled conditions. The waste material is injected directly into the exhaust pipe of the engine. In no other waste control system does the waste disposal operation occur under conditions of optimum efficiency and only at proper and advantageous periods of time. The waste, does not pollute the atmosphere, is free of harmful bacteria, and has minimal odor. (Author abstract modified)

59001

APTIC NO. 76390

Sarna, Marian

OPTIMIZATION PROBLEM OF INDUCTION OF VIBRATIONS TO ELECTROSTATIC PRECIPITATOR COLLECTION ELECTRODES. Staub, Reinhaltung Luft, 35(10):369-371, 1975. 9 refs.

Methods of inducing the vibrations that shake collected fly ash off of the collecting electrodes of electrostatic precipitators were studied. A model collecting electrode apparatus was used, consisting of a rod and a series of solid masses fixed on springs (harmonic oscillators). The propagation of an elastic stress plane wave resulting from axial impact on the end of the rod, and interaction between the rod and the solid masses was studied. The optimization of the cleaning rate is described in terms of a step function for load forces. (Author abstract modified)

59002

APTIC NO. 82333

Sasaki, Yoshio and Minoru Morita

EXHAUST GAS RECOMBUSTION ASSEMBLY FOR AN INTERNAL COMBUSTION ENGINE. (Toyota Jidosha Kogyo Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,898,803. 6p., Aug. 12, 1975. 5 refs. (Appl. May 31, 1974, 7 claims).

An internal combustion engine is described that has a recombustion apparatus that includes a recombustion chamber case connected to the exhaust ports of the engine and secured to the engine housing. An outer case surrounding the recombustion chamber case is structured so that part of the outer case is integral with the engine housing. The integral part is formed by a portion of the engine housing which extends into the area surrounding the exhaust ports. Secondary air supplied to each exhaust port or the engine is warmed in an air chamber formed in the engine housing and located in the vicinity of the recombustion apparatus. Other recombustion apparatus are held together by welding or by a complicated bolted structure. The entire apparatus must be replaced if a part of it is defective. This apparatus overcomes these difficulties. (Author abstract modified)

59003

APTIC NO. 83076

Sato, Minoru

DESULFURIZATION FACILITY OF THERMAL-POWER STATION. (Jigyoyo karyoku hatsudensho no datsuryu sochi ni suite). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 42(12):1088-1096, Dec. 1975.

The Nishinagoya Steam Power Plant of Chubu Electric Co. has introduced the Wellman-Lord method, a wet type stack gas desulfurization facility, which has been test operated since September 1973. This facility treats a total of 620,000 N cu m/hr of boiler stack gas from a 220 MW steam power plant, which is the first attempt of this kind in Japan. The facility has run 10,000/hr, desulfurized 400,000 kl of stack gas from heavy oil and has been inspected twice. The desulfurization efficiency is over 90% and the desulfurized gas contains less than 0.3% of sulfur and is reheated before being released. The operational rate of the facility is over 90% and it has had very few failures. A significant issue at present is the use of low sulfur fuel for the steam power plants, and low sulfur crude oil production is increasing. However, the development of desulfurization technology is still necessary as the country depends more and more on electricity supplied by steam power plants.

59004

APTIC NO. 84682

Sato, Takeshi

PRESENT STATUS AND FUTURE OF NEW ENGINES. (Shin engine no genjo to shorai). Text in Japanese. Preprint, Fuel Society of Japan, Combustion Section, p. 33-53, 1975. 25 refs. (Presented at the Combustion Method of New Engines Seminar, Tokyo, Japan, June 9-10, 1975.)

Various engines of the future are discussed and compared. These engines belong to three categories: those driven by continuous combustion of fuels such as gas-turbine engines or Brayton cycle engines, Rankine cycle engines, which are steam engines, and Stirling cycle engines; modifications of engines now in use, for example, layered fuel supply engines, rotary engines, and hybrid engines; and engines that make use of new fuels; for example, methanol engines, hydrogen engines, gas engines, and engines driven by modified fuels. In engines driven by continuous combustion of liquid fuels, the combustion is usually performed in the presence of excess air. Therefore, the exhaust of carbon monoxide and hydrocarbons is much less than that of conventional reciprocating engines. However, exhaust of nitrogen oxides is in large quantities, though its concentration in the exhaust gas is small. Studies may be made aimed at reducing this NOx exhaust. The basic requirements for new engines are that they meet various exhaust and noise regulations, that a wide variety of fuels be usable, and that fuel economy is satisfactory. At present none meets these requirements. Reference is also made to diesel engines and electric engines driven by storage batteries.

59005

APTIC NO. 82295

Savage, Jack Mark Charles

DEODORISATION UNIT. (Burger Boy Red Top Refreshment Kiosks Ltd., Abindgon (England)) U. S. Pat.

3,898,922. 5p., Aug. 12, 1975. 5 refs. (Appl. Aug. 2, 1973, 8 claims).

An apparatus for deodorizing cooking fumes is described which overcomes problems of grease buildup associated with prior art deodorization devices. The unit consists of several absorbent or porous wicks extending between an upper deodorizing fluid reservoir and a lower container for surplus deodorizing fluid. A pump is provided for periodically returning surplus deodorizing fluid from the lower container to the upper reservoir. The wicks are kept constantly moist throughout their entire length by employing gravity feed and by controlling the drip rate. The arrangement of the wicks is staggered so that the fumes to be deodorized are carried in a turbulent path past the wicks, thus giving good contact between the fumes and the wicks.

59006

APTIC NO. 83916

Savraev, V. P. and V. V. Zapasnyy

GAS CLEANING IN IMPACT ACTION SCRUBBERS. (Ochistka gazov v skrubberakh udarnovo deystviya). Text in Russian. Tsvetn. Metal., 39(5):29-32, May 1975.

A gas purification process by means of impact-action scrubbers (Doyle) is presented. This instrument, developed by Doyle, consists of a body, a nozzle accelerator, a drainage device, and a spray-guard. The scrubber setup is improved by sprinkling the gas with a fluid in the conduit before it reaches the nozzle accelerator. In the central portion of the scrubber body, a grid with an attachment of ceramic links is placed, and sprinkled with a solution. This apparatus combines the principles of a high-speed dust collector venturi tubes), an impact-action dust separator, and a packed scrubber. This type of scrubber effectively removes dust particles more than 2-3 micrometer in diameter. It is recommended for use in metallurgical processes involving wet gases. The scrubber is constructed of corrosion-proof material. For the removal of the spray from the sprinkling fluid in the departing gases, a safety trap of a rosette-like in the gas conduit at the scrubber outlet is important. The rate of dust elimination in impact-action-type scrubbers is 95-98%, and the final dust content of the gases ranges from 0.15-0.24 g/cubic m. The speed of the gases at the nozzle outlet varies from 40-50 m/s, the hydraulic resistance of the scrubbers from 120-150 mm H₂O, (in the safety trap, about 30 mm H₂O).

59007

APTIC NO. 82981

Scarritt, Frank M., Sr.

THERMO-JET CARBURETOR. (Assignee not given.) U. S. Pat. 3,875,917. 6p., April 8, 1975. 9 refs. (Appl. Feb. 7, 1973, 8 claims).

A thermo-jet carburetor for controlling the flow rate and air fuel ratio of fuel mixtures to internal combustion engines to improve combustion efficiency to reduce air pollution is described. The air fuel ratio of a throttle controlled carburetor is regulated as a function of the speed, load, and temperature of the engine as well as throttle valve position by the joint control of vacuum and temperature responsive devices over a fuel metering device. A thermostat senses only the temperature of the coolant in the engine cooling system to regulate flow of vaporized fuel through the fuel metering device into the mixing chamber of the carburetor. Modifications in other systems are expensive and require frequent maintenance to remain effective, or they improve combustion efficiency under certain conditions at a sacrifice to operational efficiency under other conditions. (Author abstract modified)

59008

APTIC NO. 82080

Scheitlin, George E. and Robert Lee Vautaw

CATALYTIC CONVERTER. (Arvin Industries, Inc., Columbus, Ind.) U. S. Pat. 3,915,658. 4p., Oct. 28, 1975. 12 refs. (Appl. Nov. 9, 1972, 1 claim).

A catalytic converter adapted to house a refractory element containing a catalyst for removing pollutants from the exhaust

gases of internal combustion engines is described. The element is carried in an open ended casing. One end is flanged inwardly to form a seat for the element, and a ring is mounted in the opposite casing end to retain the element against the seat. A mesh sleeve is interposed between the element and casing. The casing has an inlet and outlet mounted on the opposite ends. This is a durable construction which is easily mounted and which overcomes the problems of breakage common in other converters. (Author abstract modified)

59009

APTIC NO. 83101

Scherenberg, Hans O.

METHOD FOR THE OPERATION OF AN INTERNAL COMBUSTION ENGINE WITH AFTERBURNER CHAMBER AND INSTALLATION FOR CARRYING OUT THE METHOD. (Daimler-Benz Aktiengesellschaft, Stuttgart-Unterturkheim (Federal Republic of Germany)) U. S. Pat. 3,877,222. 8p., April 15, 1975. 10 refs. (Appl. Nov. 10, 1972, 14 claims).

A method and apparatus for operating a four-cycle internal combustion engine used for driving a vehicle is described. The beginning of the opening of the exhaust valve is advanced from a middle rotational or load range of the engine, with a decreasing rotational speed and/or decreasing load of the engine. Unlike other engines, this engine achieves a favorable gas exchange process and an increased efficiency, beginning from a middle rotational speed or load range. The beginning of the opening of the exhaust valve may be advanced or shifted to an earlier instant with an increasing rotational speed and/or increasing load. The device insures that exhaust gases in the afterburner chamber are sufficiently heated for complete combustion, even at idling or the lower partial load range. (Author abstract modified)

59010

APTIC NO. 79603

Scheriau, Robert and E. Hammerschmid

THE DESIGN OF STEAM TURBINES WITH REGARD TO WASTE STEAM UTILIZATION - PART II. (Die Gestaltung von Dampfturbinen im Hinblick auf die Abdampfverwertung - Teil II). Text in German. Energie (Munich), 27(6):167-171, 1975.

The uses of different steam turbines and their combinations, and the technological aspects of waste heat utilization for remote heating and for electricity generation are discussed. Condensation turbosets are recommended for waste heat utilization or in waste incinerator plants wherever it is impossible to utilize the thermal energy of the low-pressure steam in an economical manner. The energy incorporated in municipal and other wastes can be best utilized by joint combustion with conventional energy carriers in thermal power plants, or in waste-fired incinerator plants.

59011

APTIC NO. 82001

Schlading, Hermann J.

DEVICE FOR VAPORIZING FUEL OIL. (Assignee not given.) U. S. Pat. 3,914,096. 5p., Oct. 21, 1975. 4 refs. (Appl. April 3, 1974, 7 claims).

A fuel oil vaporizing apparatus for obtaining substantially complete combustion of the fuel and thus reducing waste gas emissions is described. The unit utilizes the principle of heat exchange to substantially reduce power requirements in comparison with those of prior art devices. The liquid fuel is vaporized in two or more stages. A small quantity of fuel is first passed through a porous body which is electrically heated. The resultant vapor is then mixed with air and combusted, and the heat thus generated is used to vaporize a larger quantity of fuel. This larger quantity of fuel is also passed through a porous body which is heated by contact with the combustion gases of the first stage. (Author abstract modified)

CONTROL METHODS

59017

59012

APTIC NO. 83119

Schlamersdorf, John Michael

APPARATUS FOR TREATING PARTICULATE MATTER WHILE IN A FLUIDIZED STATE. (Miles Labs., Inc., Elkhart, Ind.) U. S. Pat. 3,886,895. 4p., June 3, 1975. 4 refs. (Appl. Nov. 16, 1972, 3 claims).

An apparatus for treating particulate matter while in a fluidized state in a plurality of fluidized bed chambers is described. Each treating unit includes a fluidized bed chamber having means for gas flow external to the fluidized chamber and into the inlet, and means for cooperatively regulating the flow of gas through the chamber and through the bypass into the inlet. A substantially constant flow of gas is maintained there into from the treating unit. In this way the flow of gas through each unit is unaffected by operating conditions of the other units of the apparatus. The outlet from the gas flow is conveniently connected to suitable treating equipment for recovery of solvents and of solid particles included in effluents from the apparatus and for the performance of other operations thereon to render such effluents ecologically acceptable. Unlike other devices, this apparatus combines the degree of control normally obtained with independent fluidized beds with the economy of a continuous type operation. (Author abstract modified)

59013

APTIC NO. 82369

Schmid, Paul and Albert Driesch

DEVICE FOR FILTERING AND/OR TREATING LIQUID OR GASEOUS MEDIA. (GHH Basel AG, Basel (Switzerland)) U. S. Pat. 3,897,342. 5p., July 29, 1975. 2 refs. (Appl. Nov. 2, 1973, 4 claims).

A device for filtering and/or treating liquid or gaseous media is described which is simpler in construction than prior art designs. The device consists of a filter which is dismountably inserted between shell-shaped inlet and outlet housing portions. The filter is supported on two plates, with each supporting plate defining a cavity for receiving a part of the filter. Extending from the filter insert are two nipples, one passing through one supporting plate into the inlet end and the other passing through the other supporting plate into the outlet end. Fluid-tight seals in the limited spaces seal the inlet and outlet ends. (Author abstract modified)

59014

APTIC NO. 82557

Schmid, Werner

CARBURETORS FOR INTERNAL COMBUSTION ENGINES. (Societe Industrielle de Brevest et d Etudes S.I.B.E., Neuilly-sur-Seine (France)) U. S. Pat. 3,877,448. 5p., April 15, 1975. 7 refs.

An auxiliary starting device for cold starting of carburetors for internal combustion engines is described. The device is adapted to deliver a flow rate of fuel into the intake pipe in addition to the flow rate necessary for hot idling of the engine, and is directly or indirectly responsive to the temperature of the engine. Regulations exist which are intended to limit atmospheric pollution and insure that the flow rates of air and fuel in the carburetor are more and more accurately metered, especially when starting a warm engine (20 C). For a warm engine to start and rotate at low speed, the richness of the air/fuel mixture which it receives must be slightly increased with respect to the richness corresponding to the normal running temperature of the engine. It is difficult to determine this slight enrichment by means of the starting valve since a slight error in the angular position of this valve involves a large modification of the richness of the slow speed mixture, and this all the more as the flow rate of air at slow speed (idling) is smaller. The carburetor delivers a mixture whose richness is well adapted to the temperature of the engine, whatever the condition of the engine from start.

59015

APTIC NO. 82115

Schmidt, Hans-Georg

INTERNAL COMBUSTION ENGINE, ESPECIALLY FOR AIR COMPRESSING INJECTION ENGINE. (Daimler-Benz Aktiengesellschaft (Federal Republic of Germany)) U. S. Pat. 3,914,944. 4p., Oct. 28, 1975. 2 refs. (Appl. May 22, 1974, 8 claims).

An air compressing injection internal combustion engine is described which is equipped with an exhaust gas turbocharger. A portion of the exhaust gases are conducted back to the inlet side of the internal combustion engine. A by-pass line is provided for the return conduction of exhaust gases. It is connected with the exhaust gas line between the internal combustion engine and turbine and to the inlet line between the compressor or supercharger and the internal combustion engine. A type of self-regulating effect is achieved in this engine by dispensing with any control device, by a corresponding matching of the cross section of the by-pass line and of the supercharger with its effective cross sections. The pressures in the exhaust gas and in the compressed air are so matched to one another that at low loads, larger amounts of exhaust gases are conducted back, and more particularly up to a point at which the pressure in the compressed air is larger than the exhaust gas. Beginning with this point in the diagram, which as a rule lies at 4/5 load, no exhaust gas is conducted back any more but instead, compressed air flows proportionately into the exhaust gas. Overloading of the engines as a result of excessively high combustion pressures cannot occur. At full load operation in air compressing engines there is no deterioration of the engine due to undesired exhaust gas quantities.

59016

APTIC NO. 82554

Schmidt, Karl-Walter

EXHAUST INSTALLATION FOR A ROTARY PISTON INTERNAL COMBUSTION ENGINE. (Daimler-Benz Aktiengesellschaft (Federal Republic of Germany)) U. S. Pat. 3,882,681. 7p., May 13, 1975. 6 refs. (Appl. Nov. 27, 1972, 12 claims).

An exhaust installation for a rotary piston internal combustion engine, especially of trochoidal construction is described. There is one polygonal piston for each disk, rotating within a housing and with working chambers between the housing and the piston. One inlet channel and one outlet or exhaust channel are arranged for each disk in the housing. An exhaust pipe adjoins the exhaust channel. The length of the exhaust installation, in contrast to other systems, is short and does not prevent a filling of the working chambers necessary for a large power output and a high efficiency of the engine.

59017

APTIC NO. 82913

Schmidt, Peter, Harald Kizler, Wolfgang Maisch, Bernd Peter, Joseph Wahl, Ernst Linder, and Horst Neidhard

EXHAUST GAS COMPOSITION CONTROL WITH AFTER-BURNER FOR USE WITH INTERNAL COMBUSTION ENGINES. (Robert Bosch GmbH, Gerlingen-Schillerhohe (Federal Republic of Germany)) U. S. Pat. 3,874,171. 11p., April 1, 1975. 13 refs. (Appl. June 2, 1972, 17 claims).

A thermo reactor formed as an afterburner to receive the exhaust gases and burn carbon monoxide and unburned hydrocarbons is described. A catalytic reactor is connected in series downstream to reduce nitrogen oxides. An oxygen sensor is exposed to the exhaust gas stream between the thermo reactor and the catalytic reactor. It supplies a control signal to an amplifier which, in turn, controls one or both of the components air and fuel of the fuel-air mixture to the engine in such relative proportions of mass that the exhaust sensed by the sensor is just slightly below the stoichiometric ratio of air and fuel. Other systems require additional equipment for the two separate catalysts which are required and for ammonia which must be available. (Author abstract modified)

59018

APTIC NO. 83149

Schmidt, Peter, Harold Kizler, and Gerhard Hartmann

METHOD AND APPARATUS TO REDUCE NOXIOUS COMPONENTS IN THE EXHAUST EMISSIONS OF INTERNAL COMBUSTION ENGINES. (Robert Bosch GmbH, Stuttgart (Federal Republic of Germany)) U. S. Pat. 3,871,338. 10p., March 18, 1975. 4 refs. (Appl. Aug. 20, 1973, 10 claims).

A method and apparatus to reduce noxious components in the exhaust emissions of automotive internal combustion engines are described. The control limits, or the control range of the controller is expanded in a simple and effective manner to better control the air number lambda. A threshold switch is provided which responds when a certain operating parameter is exceeded. The threshold switch, upon response, changes the base setting of the air/fuel supply device to the engine. Conventional methods of controlling the tolerance results in a limitation of the entire range of control by the supply or control signals for the device.

59019

APTIC NO. 83973

Schmidt, Paul

DUST CENTRIFUGE. (Staubzentrifuge). Text in German. Chem.-Ing.-Tech., 47(3):107, 1975. 3 refs. (The full-length text can be obtained from: Verlag Chemie GmbH, Weinheim, Postfach 1260, West Germany).

A discussion of attempts made to improve the efficiency of centrifugal dust separators is presented. Four types of separators are compared: the conventional cyclone and two models derived from it, and an axial dust centrifuge similar to the Wilson model. The two models derived from the conventional cyclone are a cyclone with a fixed core and split diffuser and a dust centrifuge known as the dust removal apparatus with a radial blower. The pressure drop coefficients for the various types are as follows: 10 for the conventional cyclone, 4 for the cyclone with a fixed core and a split diffuser, 3 for the dust removal apparatus, and 5 for the axial centrifuge. The pressure drop coefficient cannot be measured directly for the dust removal apparatus, and, therefore, was calculated on the basis of motor horsepower, efficiency and throughput. An advantage of the axial centrifuge is that much of the kinetic energy of the gas is regained through a turbine step. It is useful in dust removal from recycle gas and intake air for internal combustion engines.

59020

APTIC NO. 82297

Schmidt, Thomas R. and Gary B. Schinman

METHOD AND APPARATUS FOR CONTROLLING THE ADDITION OF A COMBUSTION ASSISTING FLUID TO A FLARE. (Shell Oil Co., Houston, Tex.) U. S. Pat. 3,891,847. 6p., June 24, 1975. 2 refs. (Appl. Feb. 13, 1974, 10 claims).

A method for controlling the flow of a combustion-assisting fluid to a flare used for disposing of combustible gases and thus achieving more complete and smokeless combustion is described that is more responsive and easier to maintain than prior art control devices. A self-generating type of photocell is used to detect the radiation emitted by the flare, and the resulting signal is used to control the flow of the combustion-assisting fluid. The photocell's field of view is limited to the lower portion of the flame or flare plus an additional portion of the top of the stack to ensure that the photocell accurately views the bottom of the flame or flare even when the flare tends to migrate down the top of the stack or to one side. The photocell mounting is located to the south of the stack, and the stack is viewed to the north so that the photocell is not subject to direct sunlight. (Author summary modified)

59021

APTIC NO. 82305

Schoeck, Vincent E.

FILTER BAG. (Carborundum Co., Niagara Falls, N. Y.) U. S. Pat. 3,890,125. 4p., June 17, 1975. 4 refs. (Appl. April 1, 1974, 4 claims).

AIR POLLUTION ABSTRACTS, JUNE 1976

An improved bag filter which possesses greater strength and flexibility than conventional filter bags with sewn seams is described along with the process for its construction. The filter bag consists of a tubular body of thermoplastic material with a longitudinal joint formed by fusing together overlapping portions of the material. The fusing process is performed by overlapping the edge portions of a length of the thermoplastic material, heating at least one of the overlapping edges to a temperature above the softening point, and compressing the overlapping portions of the material together to form a fused seam. The apparatus for forming the fused seam includes a blade-shaped heating element for contacting the edge portion of the thermoplastic material and a pair of opposing rollers for compressing the overlapping portions of the material. (Author summary modified)

59022

APTIC NO. 83964

Schuetz, H.

POSSIBLE USES OF COMPACT DUST SEPARATORS.

(Einsatzmöglichkeiten von Kompaktentstaubern). Text in German. TZ Prakt. Metallbearb., 69(4):120-123, April 1975.

Compact dust separators and their possible uses in industry and behind firing equipment are described. Compact dust separators equipped with tissue filters are available with capacities of 200-1200 cu m/hr. They have a separation efficiency of 99%. Dust separators with non-woven fabric filters are used increasingly for oil mist separation, especially in a concentration range of 100-150 mg/cu m, while higher concentrations require the use of a coarse filter. Compact separators working on the electrostatic separation principle are used also for oil mist separation with a voltage of 13 kV. A special compact separator, equipped with glass-fiber filter mat, has been developed for the separation of particles larger than 5 microns from combustion equipment firing extra light fuel oil. The number of the filter mats in the filter may range from 3 to 40. Available in 6 different sizes, these separators can be used for firing equipment with capacities ranging from 200,000 to 5,200,000 kcal/hr.

59023

APTIC NO. 76388

Schwab, H. and W. Kaschke

SLIME AND ODOR ELIMINATION IN PROCESS WATER OF THE PAPER INDUSTRY. (Schleim- und Geruchsbekämpfung von Fabrikationswaassern in der Papierindustrie). Text in German. Papier (Darmstadt), 29(10A):V43-V51, 1975. 11 refs.

Chemical products that promote odor and slime elimination in the paper and pulp industry by means of oxidation are described. The products are CLARMARIN K, sodium chlorite 300 W, and per-acetic acid. Hydrogen sulfide in board mills can be controlled by CLARMARIN K. Sodium chlorite 300 eliminates slime in closed water circuits and reduces the number of surface germs. The anti-microbial effect of per-acetic acid is discussed. The safety of these substances at the recommended effective concentrations is evaluated using BSB subscript 5 toxicity measurements.

59024

APTIC NO. 75987

Schwartz, W. A., F. B. Giggins, Jr., J. A. Lee, R. B. Morris, R. Newirth, and J. W. Pervier

ENGINEERING AND COST STUDY OF AIR POLLUTION CONTROL FOR THE PETROCHEMICAL INDUSTRY. VOLUME 7: PHTHALIC ANHYDRIDE MANUFACTURE FROM ORTHO-XYLENE (FINAL REPORT). Air Products and Chemicals, Inc., Marcus Hook, Pa., Houdry Div., Office of Air and Waste Management Contract 68-02-0255, Rept. EPA-450/3-73-006-g, 108p., July 1975. 20 refs.

NTIS: PB 245277/AS

An engineering and cost study of air pollution abatement methods for the phthalic anhydride manufacturing (from ortho-xylene) industry is presented. Air emissions from the industry

CONTROL METHODS

59031

fall into the categories of organic acids and anhydrides, hydrocarbons, and carbon monoxide. Either scrubbers or incinerators on the main process vents appear to be equally efficient in controlling organic particulates. However, if carbon monoxide is also to be controlled, then an incinerator is the most feasible demonstrated control device. The capital required for abatement equipment is estimated to be about 13% of the total investment required for a plant.

59025

APTIC NO. 84276

Schwarz, M. and H. Hoelscher

MOISTENING AND GRANULATING MINERAL DUSTS IN A PLOUGH-TYPE MIXER. (Befeuchtung und Granulierung mineralischer Staube im Pflugscharmischer). Text in German. *Aufbereitungs-Technik*, no. 12:652-655, 1975.

A special design of the mixing device increases whirling turbulence and partially fluidizes the products that are mixed. Large surface areas result, allowing uniform moistening of the particles by spraying. In many cases the mixing device permits granulating the dust, which prevents dust emissions and eases transportation and storage of the product.

59026

APTIC NO. 83891

Scott, D. S.

A NEW APPROACH TO THE ACOUSTIC CONDITIONING OF INDUSTRIAL AEROSOL EMISSIONS. *J. Sound Vib.*, 43(4):607-619, Dec. 22, 1975. 35 refs.

The use of saw tooth waves for the acoustic conditioning of industrial aerosol emissions is examined. Acoustic conditioning of fine particle emissions from industrial sources is a process by which the mean size of the effluent particles is increased and their number decreased, through exposure to finite amplitude acoustic fields. In using saw tooth waves, the aerosol striations are predominantly acoustic-circulation induced, rather than the result of radiation drifts. The progressive saw tooth field does not break up the striations. For the same acoustic intensity, a single progressive saw tooth field achieves a greater coagulation rate than a single standing, especially sinusoidal field. The total (sum of capital, maintenance, and operating annual gas cleaning costs) for acoustic dust conditioning using saw tooth waves is estimated and compared with conventional gas cleaning systems. The proposed configuration allows cost reductions to be achieved which bring the process, economically, into a range comparable to conventional processes.

59027

APTIC NO. 81753

Scott, Milford M., Jr.

SELF-MODULATING AIR BLEED APPARATUS AND METHOD FOR INTERNAL COMBUSTION ENGINE. (STP Corp., Fort Lauderdale, Fla.) U. S. Pat. 3,913,541. 6p., Oct. 21, 1975. 7 refs. (Appl. Feb. 8, 1974, 11 claims).

A self-modulating air bleed system which reduces automobile exhaust emissions by automatically controlling the amount of air bled into the intake manifold of an internal combustion engine is described. Air is introduced continuously into the intake manifold of the engine through a first channel and is introduced periodically into the intake manifold through a second channel which is modulated by the vacuum conduit used to control the vacuum advance unit of the engine spark distributor. The first channel is manually adjusted to control the amount of air bled while the engine is idling. (Author abstract modified)

59028

APTIC NO. 83171

Seliber, Joseph

LOW POLLUTION AND FUEL CONSUMPTION FLYWHEEL DRIVE SYSTEM FOR MOTOR VEHICLES. (Assignee not given.) U. S. Pat. 3,870,116. 8p., March 11, 1975. 5 refs. (Appl. Aug. 15, 1973, 8 claims).

A hybrid propulsion system which uses an energy storing flywheel as a source of energy is described. The engine and flywheel are associated with each other in a novel manner which results in both improved fuel economy and a reduction of air pollution. Prior art systems have problems such as excessive flywheel weight and the high cost of efficient variable speed transmissions. This hybrid propulsion system utilizes the principle of operating a vehicular engine at constant speed and high brake mean effective pressure. For limited distances the vehicle produces zero emissions. This is particularly important in urban communities where pollution is most damaging. Zero emissions permit the vehicle to enter and leave a central business district without generating emissions.

59029

APTIC NO. 75988

Selker, Ambrose P.

PROGRAM FOR REDUCTION OF NOX FROM TANGENTIAL COAL-FIRED BOILERS. PHASE II (FINAL REPORT). *Combustion Engineering, Inc., Windsor, Conn., Environmental Protection Agency Contract 68-02-1367, Program Element 1AB014, ROAP 21ADG-080, Rept. EPA-650/2-73-005-a, 144p., June 1975. 2 refs.*

NTIS: PB 245162/AS

The effects of variations in excess air, unit slagging, load, and overfire air on the nitrogen oxide emissions from a tangential coal-fired test boiler were evaluated. Excess air variation exerted the greatest single effect on NOx emission levels under normal unit operation without overfire air. An average increase of 0.014 g nitrogen dioxide/million cal was observed for each 1% increase in excess air. Unit loading and variation in furnace slag conditions exerted the least effect on both NOx and carbon monoxide emission levels as well as on the percent of carbon in the fly ash. Carbon monoxide emission levels and percent carbon loss in the fly ash increased with decreasing excess air, especially below an excess air level of 20-25%. Nitrogen oxide reductions of 20-30% were obtained with 15-20% overfire air when operating at a total unit excess air of approximately 15%. Optimum overfire air operation was obtained when the overfire air nozzles were tilted with the fuel nozzles. Nitrogen oxide emissions increased when the nozzles were directed toward each other. (Author conclusions modified)

59030

APTIC NO. 76101

Selker, Ambrose P.

PROGRAM FOR REDUCTION OF NOX FROM TANGENTIAL COAL-FIRED BOILERS. PHASE IIA. NOX CONTROL TECHNOLOGY APPLICATION STUDY (FINAL REPORT). *Combustion Engineering, Inc., Windsor, Conn., Environmental Protection Agency Contract 68-02-1367, Program Element 1AB014, ROAP 21ADG-080, Rept. EPA-650/2-73-005-b, 37p., Aug. 1975. 1 ref.*

NTIS: PB 246889/AS

Laboratory and field tests were conducted to determine the effectiveness of using overfire air to control nitrogen oxide emissions from tangential coal-fired boilers. Nitrogen oxide reductions of 20-30% were obtained with 15-20% overfire air when operating at a total unit excess air of about 15-20% as measured at the economizer outlet. This condition provides an average fuel firing zone stoichiometry of 95-100% of theoretical air. Stoichiometries below this level did not result in large enough decreases in NOx levels to justify their use. The cost of installing an overfire air system on an existing unit is estimated to range between two to four times the cost associated with a new unit. Approximately 40% of the existing coal fired units in the United States are of tangential design and can conceivably be modified to incorporate overfire air systems.

59031

APTIC NO. 82594

Selmeczi, Joseph G. and James P. Miller

SOLUBILITY OF SULFUR DIOXIDE IN AQUEOUS ELECTROLYTES. *Preprint, Purdue Univ., West*

Lafayette, Ind., 32p., 1975. 21 refs. (Presented at the Purdue Air Quality Conference, Annual, 14th, Indianapolis, Ind., Nov. 12, 1975.)

A theoretical review of the solubility of sulfur dioxide in aqueous electrolytes is presented in connection with its absorptive removal from gas streams. Sulfur dioxide partially dissociates when absorbed in pure water, with the predominating species being the bisulfite anion in equilibrium with an SO₂ pressure of less than 0.004-0.008 atmospheres. At higher SO₂ pressures, the undissociated molecular species sulfurous acid and aqueous SO₂ predominate. The sulfite species and the molecular species do not co-exist in appreciable concentration. The total solubility of SO₂ in pure water is low, requiring very high liquid-to-gas ratios for complete absorption. The liquid-to-gas ratio increases with temperature and SO₂ partial pressure. Strong buffers increase the solubility more than the concentration of the basic buffering species. (Author conclusions modified)

59032

APTIC NO. 82035

Sergeys, Frank John, James Michael Maselli, and Michael Vance Ernest

STABILIZED AUTOMOTIVE EXHAUST GAS CATALYST. (Grace (W. R.) and Co., New York) U. S. Pat. 3,903,020. 9p., Sept. 2, 1975. 3 refs. (Appl. Feb. 15, 1974, 7 claims).

A process for preparing an ultra stable oxidation catalyst for the control of hydrocarbon and carbon monoxide emissions from internal combustion engines is described. The catalyst is produced by applying a solution of a salt of a noble metal such as palladium or platinum to a specially prepared support followed by activation at 1800-2100 F. The special support is prepared by activating and stabilizing common support materials such as alumina with cerium oxide at high temperatures prior to application of the noble metal. The catalyst is stable to 2100 F. (Author abstract modified)

59033

APTIC NO. 83523

Serruys, Max

IS HIGH ENERGETIC EFFICIENCY OF INTERNAL COMBUSTION ENGINES COMPATIBLE WITH AN EXHAUST OF VERY LOW TOXICITY? (*Le moteur a explosion peut-il fournir a la fois un haut rendement energetique et des gaz brules a tres faible toxicite?*) Text in French. Rev. Gen. Thermique (Paris), 14(160):267-273, April 1975.

By incorporating 2 successive combustion phases in an internal combustion engine (the first cycle being fed with a rich mixture based on leadless fuel, and the second with a lean mixture consisting of air and the burnt gases from the first cycle), it should be possible to obtain a superior thermal output (36% instead of the usual average of 30%), and a significant reduction in carbon monoxide, hydrocarbon, nitrogen oxide, and lead concentrations in the gases released into the atmosphere. The first cycle destroys the nitrogen oxides; the composition of the burnt gases from that cycle being known, the quantity of air necessary to obtain a richness of about 0.8-0.85 (to promote complete combustion) is easily calculated. To achieve satisfactory practical application of such a process, the volume of each cycle should constantly remain within a certain well-defined ratio in order to automatically obtain desired functioning regardless of the rotation speed. The best prospect seems to be a motor with 2 rows of cylinders and a single crankshaft, where all the cylinders have the same throw, and which has the same number of cylinders for the first and second phase but with different calibers to obtain the desired interaction between cylinders.

59034

APTIC NO. 82421

Seth, Ram Gopal

METHOD AND APPARATUS FOR GENERATING HIGH TEMPERATURE ZONE USING FIXED-FLUIDIZED

AIR POLLUTION ABSTRACTS, JUNE 1976

BED. (Assignee not given.) U. S. Pat. 3,892,538. 6p., July 1, 1975. 5 refs. (Appl. Feb. 28, 1973, 3 claims).

A method and apparatus for generating high temperatures within a controlled zone by utilizing a fixed fluidized bed are described. Larger fixed particles are used which are incapable of fluidization. They are located in the lower region of a bed of smaller particles capable of fluidization. A combustible gas mixture is burned within the bed and passed through the bed at a superficial velocity at or slightly below the minimum fluidization velocity of the smaller fluidized particles. The larger fixed particles stabilize the fluidization of the bed and permit the combustion of the gases to be localized within a small high temperature zone at the top of the fluidized bed. This overcomes the problems associated with other processes.

59035

APTIC NO. 83756

Seymour, James E.

PROCESS FOR REDUCING THE CONCENTRATION OF FERTILIZER PARTICULATES IN EXHAUST STACK GASES. (Royster Co., Norfolk, Va.) U. S. Pat. 3,885,946. 6p., May 27, 1975. 7 refs. (Appl. May 11, 1974, 25 claims).

A method of reducing the particulate pollution of the atmosphere by the exhaust stack gases of fertilizer manufacturing and processing plants is described. Solutions of nitrogen-containing compounds are sprayed upon the fertilizer particulates prior to the air cooling phase of the operation. This bonds relatively fine, dust-like particles to each other and to relatively larger particles, and reduces the emission of such particles into the ambient atmosphere through the air cooler exhaust. Other particulate removing systems use dry cyclone separators which are not effective for particulates below 10 micron in diameter. Systems using wet cyclones require expensive scrubbers. (Author abstract modified)

59036

APTIC NO. 79663

Shanmuga Sundaram, S. and V. Pachaiyappan

DISTILLERY WASTES--DISPOSAL BY BY-PRODUCT RECOVERY. Chem. Age India, 26(2):97-100, Feb. 1975. 16 refs.

The causes and prevention of air pollution from distillery wastes in India are discussed. In the production of alcohol, the residual liquid, called spent wash, is usually evaporated in pits. This method of disposal pollutes the wells in that area causing a brown color in the well water and high B.O.D. (biological oxygen demand) with the unpleasant smell prevailing in that area. Anaerobic lagooning is an effective method for the treatment of distillery wastes. The lagoons may be simple open trenches having a depth ranging between 4 and 20 ft depending on the soil and ground water conditions. The smell nuisance can be eliminated if lagoons are designed and operated properly. Oxidation ditches and high rate trickling filters are also efficient in B.O.D. reduction. By-product recovery schemes include mixed fertilizer and cattle feed production and recovery of methane gas from spent wash.

59037

APTIC NO. 76247

Shanmugasundaram, S., K. N. Panneerselvam, and V. Pachaiyappan

POLLUTION FROM FERTILIZER PLANTS: TREATMENT OF WASTE WATERS, REMOVAL OF H₂S AND CO₂. Chem. Age India, 26(4):279-283, April 1975. 24 refs.

Methods for the removal of hydrogen sulfide and carbon dioxide from waste gases generated by phosphatic and nitrogenous fertilizer plants are reviewed. The most commonly used scrubbing solvents in absorption control processes serving fertilizer plants include ethanalamines, solutions of sodium or potassium salts of aminofatty acids, phosphates, and phenolates. Adsorptive removal of H₂S can be achieved with iron oxides, with the optimum pH range being around 7.0. Other solid adsorbents like zinc oxide, activated carbon, alumina,

CONTROL METHODS

59044

bauxite, and zeolite can also be used. The recovery of sulfur from H₂S can be performed in two stages using a thermal reaction boiler followed by a catalytic converter. The liquid sulfur obtained is then solidified in a refrigeration system.

59038

APTIC NO. 82054

Sharer, John E., Jon B. Pangborn, and Raymond J. Dufour

CATALYTIC FLUID HEATER. (Inst. of Gas Tech., Chicago, Ill.) U. S. Pat. 3,910,255. 4p., Oct. 7, 1975. 7 refs. (Appl. Feb. 15, 1974, 4 claims).

A catalytic fluid heater is described for application as a household water heating appliance. It optionally humidifies the home or produces distilled quality water. A small, 4-inch diameter engineering model was constructed and tested for proof of concept. At a throughput of 8 gal/hr, it requires a reformed gas feed rate of 7000 Btu/hr of about 27 cu ft/hr. The reformed gas is 78% hydrogen, 20.5% carbon dioxide, 1% methane, and 0.5% carbon monoxide, with a high heating value of 260 Btu/cu ft. The temperature rise in the water going through the unit is 80 C. Based on the high heating value of the fuel gas, the unit is 73% thermally efficient. Before steam condensation, the warm flue gas (150-180%) contains essentially air, steam, and nitrogen. The levels of CO and oxides of nitrogen are negligible and essentially the same as ambient room air.

59039

APTIC NO. 83104

Shaw, Alexander

FUME INCINERATOR. (Assignee not given.) U. S. Pat. 3,880,594. 4p., April 29, 1975. 4 refs. (Appl. Sept. 28, 1972, 7 claims).

A fume incinerator containing an afterburner for burning the combustibles in the exhaust from a restaurant is described. Primary and secondary combustion chambers are provided with semi-circular baffles which cause exhaust gases to pass in a circular pattern before passing through the outlet from the combustion chamber. The total retention time of the gas within the afterburner unit is 0.5 sec. In prior art baffling arrangements, the gas is held back so that the necessary flow through the unit of approximately 2500 cfm cannot be sustained. (Author abstract modified)

59040

APTIC NO. 82430

Sheely, Harold R.

DISPOSAL OF WASTE MATERIALS FROM UNSATURATED NITRILE. (Badger Co., Ltd., Cambridge, Mass.) U. S. Pat. 3,895,050. 10p., July 15, 1975. 4 refs. (Appl. Nov. 8, 1973, 11 claims).

A process for disposing of waste materials from an acrylonitrile or methacrylonitrile plant is described. Waste water, unreacted ammonia, and by-products such as hydrogen cyanide and acetonitrile are not condensed but remain with the absorber off gas for ultimate disposal by incineration. The method employs a hydrocarbon solvent to adiabatically quench the reactor effluent, and after removal of polymer by-products, the partially quenched effluent is passed to a hot absorber column where the nitrile product, but no ammonia and only some of the HCN, is absorbed by the hydrocarbon solvent. The nitrile solvent mixture is distilled to separately recover the solvent and nitrile product. The solvent is recycled. The hot absorber off gases are cooled to recover water, and then incinerated with ammonia, HCN, acetonitrile, and some vaporized solvent furnishing the necessary fuel values. Other control processes such as vent stack, a flare stack, an incinerator, or an ammonium salt recovery plant are expensive and do not provide a satisfactory solution that meets governmental standards. (Author abstract modified)

59041

APTIC NO. 76583

Sheridan, John H.

WHICH POLLUTION ANSWERS ARE WINNING? *Ind. Week*, 187(2):27-33, 35, Oct. 13, 1975.

Air pollution control technologies were evaluated in a survey of environmental panelists. The panelists were asked to select the air pollution control technologies which hold the greatest promise for solving industry's pollution problems. The technologies selected as promising technologies are high temperature bag filters (particulates), chemical desulfurization of coal (sulfur dioxide removal), chemical alkali scrubbing (SO₂ removal), charged particle wet scrubbing (particulates and gases) and wet electrostatic precipitators (sticky particulates and mists). Other promising technologies include: electrostatics with fabric filters (particulates), citric acid scrubbing (SO₂ removal), catalytic oxidation (SO₂ removal), fluidized bed combustion (SO₂ removal), and metallic oxide catalysts (nitrogen oxides removal).

59042

APTIC NO. 82423

Shibano, Kenji

CONNECTING METHOD FOR LINER-PORT BETWEEN CYLINDERS FOR THE EXHAUST GAS CONTROL.

(Haikigas taisaku no tameno kitokan rainaboto ketsugo hoshiki). Text in Japanese. (Fuji Heavy Industries, Japan) Japan. Pat. Sho 50-18529. 3p., June 30, 1975. 2 refs. (Appl. June 21, 1971, 1 claim).

A connecting method for the liner-port between cylinders of a 4-cycle engine is described. A check valve is equipped in an air reservoir in the path between two cylinders. The check valve is used to prevent the combustion gas from going into an air inlet duct through which air is supplied by an air pump. When the piston of cylinder 1 moves to the bottom dead point during an inlet stroke, the piston of cylinder 2 is at the bottom dead point of an exhaust stroke since the phase difference is 360 degrees, and the path between the two cylinders is opened. The combustion gas in cylinder 2 opens the check valve, which results in the introduction of secondary air from the air inlet duct, and the mixture gas is pushed into cylinder 1. When the piston of cylinder 2 moves to the bottom dead point during an inlet stroke, the mixture gas is pushed into cylinder 2. Test results show that the device remarkably reduces nitrogen oxides and hydrocarbons in the exhaust as compared to a conventional setting.

59043

APTIC NO. 83504

Shibuya, Akira and Yoshifumi Nitta

EMISSION GAS TREATMENT METHOD. (Haigas shori hoho). Text in Japanese. (Ishikawajima-Harima Heavy Industries Co., Ltd. (Japan)) Japan Pat. Sho 50-38226. 5p., Dec. 8, 1975. 2 refs. (Appl. June 28, 1971, 1 claim).

An exhaust gas treatment method for industrial furnaces and combustors, which will remove sulfur oxides, nitrogen oxides, mists and dust contained in the exhaust gas by using electrically transferable adsorbents is described. This process utilizes the principle of an electric field curtain. The adsorbents are circulated in the adsorption tank by the action of an electric field, and effectively adsorb the harmful substances. The adsorbents are removed out of the transfer field, washed, and recirculated. The adsorbent can be any electrically chargeable substance. This process has the following advantages: a simple control for gas and adsorbent contracting duration; an extensive contacting surface area for the adsorbent; no front and back end processes required for removal of sulfur oxides, nitrogen oxides, mist, and dust; and simple cleaning and recycling of the adsorbent, with no waste water discharged.

59044

APTIC NO. 83105

Shibuya, Tatsuo, Takashi Hosoya, Fumio Sudo, Tsutomu

Hoshino, Sunao Yamada, and Hifumi Hiraoka

PROCESS FOR PREPARING PURIFIED COKE OVEN GAS. (Mitsubishi Chemical Ind., Ltd., and Mitsubishi Kakoki Kaisha Ltd., Tokyo (Japan)) U. S. Pat. 3,880,617. 6p., April 29, 1975. 2 refs. (Appl. May 28, 1974, 3 claims).

A process for purifying coke oven gas is described. The gas, substantially free of hydrogen sulfide, is prepared by counter-

currently contacting the gas with an absorbent ammonia solution in a multi-stage absorber. The absorbent solution discharged from the absorber is divided and fed to the top and middle of a stripping tower in a ratio of 0.05 to 1 by weight. The solution is contacted with steam to remove the acidic gas from the absorbent solution. In prior art methods, the reproduced absorbent solution discharged from the bottom of the acid gas stripping (deacid) tower was directly fed to the absorber to recycle the absorbent solution. The reproduced absorbent solution contains ammonia and a small amount of hydrogen cyanide and other acidic gas components. The absorbing efficiency in the absorber is disadvantageously decreased by continued recycling over a longer period of time. (Author abstract modified)

59045

APTIC NO. 83261

Shibuya, Tatsuo, Takashi Hosoya, Fumio Sudo, and Tsutomu Hoshino

MANUFACTURING METHOD OF REFINED COKE OVEN GAS. (*Seisei kokusuro gasu no seizoho*). Text in Japanese. (Mitsubishi Kokoki Kaisha Ltd. and Mitsubishi Chemical Industries Ltd. (Japan)) Japan. Pat. Sho 50-37042. 4p., Nov. 29, 1975. (Appl. May 28, 1973, 1 claim).

This process relates to a refining method for exhaust gas from a coke furnace (COG), in which hydrogen sulfide contained in the COG is removed to produce a COG with no sulfuric composition. The acidic gas contained in the COG such as hydrogen sulfide, carbon dioxide and hydrogen cyanide may clog and corrode the tubes and pipes, and is harmful to the human body. The conventional removal method for hydrogen sulfide in a COG has a poor hydrogen sulfide recovery rate, requires a large steam consumption, and offers limited application of the recovered acidic gas. The new process mainly consists of a coke furnace, a primary cooler, a hydrogen sulfide absorption process with liquid ammonia, a deacidifying process, and an ammonia removing process. The absorption process consists of a multi-staged (5-8 stages preferably) spray column with a solution containing below 10 g/l of ammonia at a temperature of 30 C, which can economically achieve the selective absorption of hydrogen sulfide and efficient desulfurization. The deacidifying process for the absorption solution discharged from the absorption process requires an inlet solution temperature below 40 C and 0.05-0.1 wt% of solution to be introduced to the top section of deacidification column and the rest to the middle section. The recovered acidic gas contains less than 0.5 vol% of cyanic gas.

59046

APTIC NO. 76098

Shimizu, A. B., R. J. Schreiber, H. B. Mason, G. G. Poe, and S. B. Youngblood

NOX COMBUSTION CONTROL METHODS AND COSTS FOR STATIONARY SOURCES. SUMMARY STUDY (FINAL REPORT). Acurex Corp., Mountain View, Calif., Aerotherm Div., Environmental Protection Agency Contract 68-02-1318, Program Element 1AB014, ROAP 21BCC. Task 12, Rept. EPA-600/2-75-046, 115p., Sept. 1975. 65 refs.

The technology, user experience, and costs associated with nitrogen oxide control at stationary combustion sources are summarized. Significant sources are characterized by equipment type, fuel consumption, and annual mass emission of NOx. Stationary sources emit 11.7 million tons/yr (1972) of NOx, with fuel combustion accounting for 98% of this total. Utility boilers account for about 49% of the stationary source emissions. Combustion modification appears to be the most advanced and effective technique for near and far term NOx control. Nitrogen oxide control by combustion is an order of magnitude lower in capital cost than NOx or sulfur oxide control by flue gas treatment. Cost data for other equipment types is sparse. (Author abstract modified)

59047

APTIC NO. 83877

Shinzato, Takao

EXHAUST EMISSION ABATEMENT BY OPERATING CONDITION VARIATIONS ON 4-CYCLE SPARK-IGNITION ENGINE. (*4 saikuru hibana tenka kikan ni okeru unten joken ni yoru issanka tanso no no teigen*). Text in Japanese. Ryukyu Daigaku Rikogakubu Kiyo Kogakuhen (Bull. Sci. Eng. Ryuku Univ.), no. 8:17-35, 1975. 4 refs.

The effects of ignition timing, compression ratio, air-fuel ratio, and the temperature of the intake air and air-fuel mixture on carbon monoxide emission at constant engine speed were investigated using a C.F.R.-48 engine by Waukesha Motor Co. For varied engine speeds, no variation in CO concentration was observed with ignition timing. However, CO varied at constant engine speed with a high fuel-air ratio, (about 1% with respect to ignition timing of 20 deg CA). For high fuel-air ratio, the CO concentration increased with an increase in compression ratio. Especially at compression ratios which caused knocking, the CO concentration increased markedly. The variation in CO concentration was about 1% at a compression ratio of 3. When the increase in the fuel-air ratio exceeded the theoretical value, the CO concentration increased linearly. At higher intake air and fuel-air mixture temperatures, the CO concentration increased slightly.

59048

APTIC NO. 84041

Shioto, Nobuo

COUNTERMEASURES AGAINST NITROGEN OXIDES BY COMBUSTION. (*Nensho ni yoru chisso sankabutsu taisaku*). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), vol. 11:882-888, Oct. 1975. 25 refs.

The National Research Institute for Pollution and Resources (NRIPR) of the Agency of Industrial Science and Technology investigated nitrogen oxide control using the combustion method. One of the problems related to the combustion method is the effect of nitrogen contained in the fuel on the formation of NOx. It was found by an experiment conducted at the NRIPR using a small combustion furnace that the exchange rate of nitrogen to NOx was steady in the range of 30-70% regardless of the percentage of the nitrogen contained in fuel. The known combustion technology for the control of NOx formation can be divided into three different processes: to change operational conditions, to change combustion methods, and to select alternate fuels. One of the most common processes to change the combustion method is exhaust gas recirculation, which achieves only a 40% NOx reduction rate with an exhaust gas recirculation rate of 20% if class C heavy oil is used for fuel. Another popular modification of combustion is the two stage combustion method in which the combustion air supply is divided into two stages. This method is very effective even with class C oil used as fuel because it reduces the oxygen concentration at the initial stage of combustion.

59049

APTIC NO. 79752

Shokin, I. N., S. A. Krashennikov, and T. S. Gref

EXTRACTION OF SULFUR DIOXIDE FROM FLUE GASES WITH AQUEOUS SOLUTIONS OF POTASH. (*Iz vlechenie SO2 iz otkhodyashchikh gazov vodnymi rastvorami potasha*). Text in Russian. Khim. Prom. (Moscow), no. 5:369-370, 1975. 10 refs.

The absorption of sulfur dioxide in potash solution in a laboratory plate column was studied. The initial SO2 concentration was about 0.3% by volume, the potassium carbonate concentration in the water varied between 0.5 and 210 g/liter, the flow rate was between 0.34 and 1.36 m/sec, the spray density ranged from 0.154 to 0.364 m/sec, and the temperature was 20 C. At potash concentrations over 10 g/liter, the concentration of the solution had no effect on the mass exchange, and it was possible to recirculate the potash solution. The absorption rate coefficient was independent of the potassium sulfide concentration in the absorbent solution up to 0.55 molar ratio of the

CONTROL METHODS

59056

SO₂ and alkali concentrations, which indicate that potassium sulfate was just as efficient in the absorption of SO₂ as was potassium carbonate.

59050

APTIC NO. 83095

Shular, Howard Edward and John Sellers, Jr.

THERMAL INCINERATION AIR POLLUTION CONTROL DEVICE. (Pyronics, Inc., Cleveland, Ohio) U. S. Pat. 3,881,874. 9p., May 6, 1975. 5 refs. (Appl. May 7, 1973, 3 claims).

Control of air pollution from organic solvents is achieved by a device for burning air-entrained hydrocarbons. The device comprises a housing, an elongated passageway, a burner in the center of the passageway dividing the passageway into two alternating combustion chambers, honeycombed fire brick at the remote end of each chamber for absorbing heat from the exiting gases and means for periodically reversing the flow of air-entrained hydrocarbons through the passageway so that heat absorbed by the firebrick at one end of the passageway preheats the entering gases when the flow is reversed. (Author abstract)

59051

APTIC NO. 83614

Shurygin, Alexei Petrovich, Mikhail Naumovich Bernadiner, Boris Semenovich Esilevich, Georgy Nesanelovich Rubinshtein, Emanuil Ivanovich Shipov, Viktor Georgievich Gubarev, Igor Alexandrovich Lepakhin, Rudolf Rudolovich Tripushkin, Petr Mikhailovich Sharov, Boris Isaevich Lurie, Arkady Demitrievich Vodnev, Alexandr Bentsionovich Moshkovich, Pavel Alexandrovich Lupanov, Viktor Leonidovich Lukoshkin, and Tatyana Dmitrievane

Lukoshkina CYCLONE FURNACE. (Assignee not given.) U. S. Pat. 3,885,906. 8p., May 27, 1975. 6 refs. (Appl. May 21, 1974, 5 claims).

A cyclone furnace for incinerating industrial waste material containing organic or both organic and mineral components is described. It consists of a vertical cylindrical chamber with a burner arranged tangentially to its walls in its upper portion to supply fuel and air to the chamber. The fluid waste atomizers are arranged transversely of the chamber under the burner and combined with the nozzles for supplying air. An orifice is provided in the bottom of the chamber to connect the latter with the gas duct for removing combustion products. The gas duct has a tap for letting out fused mineral salts. No other furnace is capable of reliable incineration of fluid industrial waste material with a high content of organic and mineral components. (Author abstract modified)

59052

APTIC NO. 82777

Shutler, Norman D.

OVERVIEW OF INSPECTION/MAINTENANCE (I/M).

Preprint, Environmental Protection Agency, Washington, D. C., 26p., 1975. (Presented at the North American Motor Vehicle Emission Control Conference, Annual, 4th, Anaheim, Calif., Nov. 5-7, 1975.)

The importance of inspection/maintenance programs for controlling hydrocarbon and carbon monoxide emissions from motor vehicles is discussed along with the status of various programs throughout the country. Inspection/maintenance programs in New Jersey; Cincinnati, Ohio; Arizona, New York City; Chicago, Illinois; Oregon; and California are described. The impact of recent court decisions on the Environmental Protection Agency's enforcement posture regarding the implementation of inspection/maintenance programs is also reviewed. Present inspection/maintenance regulations in several states are likely to be redrafted in light of these recent court decisions. The EPA is seriously considering the use of EPA approved facilities not run by states to conduct emission inspections where states do not desire to implement an inspection/maintenance program.

59053

APTIC NO. 82379

Sibeud, Jacques Pierre and Charles David Ruff

APPARATUS FOR THE REMOVAL OF HYDROGEN SULFIDE AND MERCAPTANS FROM LIQUID AND GASEOUS STREAMS. (Rhodia, Inc., New York) U. S. Pat. 3,897,219. 12p., July 29, 1975. 2 refs. (Appl. Jan. 29, 1973, 6 claims).

An apparatus for the removal of hydrogen sulfide and mercaptans from liquid and gaseous streams is described that speeds the conversion of the above compounds by achieving an efficient contact between the oxygen gas phase, the gaseous stream, and the liquid aqueous metal chelate catalyst. A fine dispersion of oxygen, hydrogen sulfide, and any alkyl mercaptans in an aqueous metal chelate catalyst solution is passed through a contactor. A gas separator receives the dispersion from the contactor, and a sudden diminution in flow velocity in a relatively quiescent zone facilitates the breaking of the dispersion and the separation of the gas from the dispersion. The apparatus may also include a means for separating sulfur and alkyl disulfide from the liquid and recycling the liquid to the contactor.

59054

APTIC NO. 82000

Sieg, Robert Paul and Robert James White

GASIFICATION OF SOLID CARBONACEOUS MATERIALS TO OBTAIN HIGH BTU PRODUCT GAS. (Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,907,519. 6p., Sept. 23, 1975. 3 refs. (Appl. May 31, 1974, 10 claims).

A process for gasifying solid carbonaceous materials to obtain high Btu gas is described which allows for greater temperature control in the gasification zone. The process involves heating and reacting the solid carbonaceous material with reactive gases in a gasification zone to obtain combustible gases which are then withdrawn and methanated in a separate reaction zone. At least a portion of the methanated gas is fed through the gasification zone to increase the methane content and Btu value of the combustible gas and to transfer sensible heat from the methanated gas to the gasification zone.

59055

APTIC NO. 82140

Siewert, Robert M.

STAGED INTERNAL COMBUSTION ENGINE WITH MODULATING INTERSTAGE TEMPERATURE CONTROL. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,896,774. 8p., July 29, 1975. 5 refs. (Appl. July 5, 1974, 4 claims).

A staged internal combustion engine with a modulating interstage temperature control is described. After the admission of a rich air-fuel charge to an engine combustion chamber, air is added to the residual charge of combustion products and incompletely burned combustibles to form a second and preferably lean combustible mixture which is passed through a second stage cycle of compression in a separate combustion chamber. This staged process has the effect of reducing engine exhaust emissions. A temperature control valve modulates the flow of interstage gases between a heat exchanger and bypass passages to control the temperature of interstage gases delivered to the second stage combustion chamber. Automatic control means including several expandable bellows are responsive to various engine operating conditions such as the final interstage gas temperature, engine speed, and engine load to vary the interstage gas temperature in a predetermined manner and maintain desired conditions for efficiency second stage combustion. (Author abstract modified)

59056

APTIC NO. 81877

Sims, Charles W.

ACTUAL AND RECOMMENDED MAINTENANCE PRACTICES FOR LIGHT-DUTY VEHICLES FOR 1975 AND LATER MODEL YEARS. VOLUME I (FINAL REPORT). Bendix Corp., Cocoa Beach, Fla., 1974

Support Div., Office of Air and Waste Management Contract 68v03-0453, Proj. WA73-R513, Rept. EPA-460/3-75-009-a, 195p., Aug. 1975.

NTIS: PB 251736/AS

A survey among automobile consumers, new car dealerships, manufacturers, service stations, diagnostic centers, specialty shops, independent service stations, and mass merchandisers was conducted to determine the actual and recommended maintenance practices for light-duty vehicles of 1975 and later model years. Automobile dealerships were the best equipped and most informed of the maintenance service centers surveyed. A review of the 1974 Environmental Protection Agency's Durability Test showed little uniformity in the methods used by automobile manufacturers in accomplishing the maintenance portion of that test. The majority of automobile owners were unwilling to voluntarily replace a malfunctioning catalytic converter. (Author summary modified)

59057

APTIC NO. 76248

Singh, Himmat, S. K. Ghosh, and I. B. Gulati

EQUILIBRIUM ABSORPTION OF SULPHUR DIOXIDE IN STRAIGHT RUN KEROSENE. *Chem. Age India*, 26(4):309-316, April 1975. 10 refs.

Equilibrium constants and mass transfer coefficients corresponding to different partial pressures of sulfur dioxide at 0 and -5 C were experimentally determined in a batch absorption cell in order to obtain data for the design of SO₂ extraction units used for treating aromatic kerosenes in refinery operations. The value of the equilibrium constant progressively increased as the partial pressure of SO₂ increased at both temperatures and reached a maximum of 2.372 mole/cu m at 0 C and 2.03 mole/cu m at -5 C at the same partial pressure. Mass transfer coefficient values were higher for the same SO₂ partial pressure at 0 C than those at -5 C by about 1.4-1.73 kg/hr sq m atm. With a nearly constant increase in the partial pressure of SO₂ at 0.019 atm, the mass transfer coefficient changed at 0 C by 1.1-1.2 kg/hr sq m atm, while at -5 C the change was 1.0-1.2 kg/hr sq m atm.

59058

APTIC NO. 82095

Skinner, Geoffrey Frederick

SULFUR RECOVERY FROM FLUIDIZED BED WHICH HEATS GAS IN A CLOSED CIRCUIT GAS TURBINE.

(Foster Wheeler Energy Corp., Livingston, N. J.) U. S. Pat. 3,913,315, 9p., Oct. 21, 1975. 11 refs. (Appl. Jan. 10, 1974, 15 claims).

A power plant is described in which energy is produced by a gas turbine driving an electric generator. The heat for the gas turbine is produced by passing compressed gas through tubes immersed in a fluidized bed burner. The fluidized bed burner is fired with a sulfur contaminated fuel such as oil; the bed is constituted by particles which react with the sulfur. These S containing particles are then removed and the S recovered by burning the particles to give sulfur dioxide gas which can be used in the preparation of sulfuric acid. Air pollution which occurs with conventional power plants fired with S contaminated fuels can be avoided and the S recovered and used. (Author abstract modified)

59059

APTIC NO. 84036

Skogland, Ivar and Christian Viig

CHEMICAL WASHING - AN EFFICIENT ODOR ABATEMENT SYSTEM FOR HERRING OIL AND HERRING MEAL FACTORIES. (Kjemisk vask - et rimelig og effektivt luktreduksjonssystem for slidolje- og sildemel-fabrikene). Text in Norwegian. *Tidsskr. Kjemi, Bergvesen, Met.*, 35(9):21-23, Dec. 1975.

Chemical scrubbing of malodorous waste gases emitted by herring oil extraction and herring meal production plants in Norway is described in the light of recent experimental results. The malodorous emissions contain various compounds with very low odor thresholds, such as ammonia, triethylamine, in-

dole, hydrogen sulfide, methylmercaptan, dimethylsulfide, propanol, acetone, actolein, and butyric acid. Potassium permanganate, sodium hypochlorite, and hydrogen peroxide are theoretically suitable for the chemical deodorization of these malodorous waste gases in spray scrubbers. Hydrogen peroxide is often unsuitable due to its low reaction rate, while the use of potassium permanganate is restricted due to its high price and to the formation of solid reaction products which tend to clog the scrubber. Therefore, sodium hypochlorite is recommended for the deodorization. Correct dosage of the chemical and pH control are important for high efficiency.

59060

APTIC NO. 82418

Slakey, Philip B.

BAG HOUSE AND MANIFOLD SYSTEM. (*Industrial Clean Air, Inc., Berkeley, Calif.*) U. S. Pat. 3,898,062, 7p., Aug. 5, 1975. 5 refs. (Appl. Jan. 10, 1974, 4 claims).

A manifold system for bag house operations which is more compact, less costly to construct and install, and more efficient in operation than prior art systems is described. The system consists of several prefabricated modules each of which is connected to a pair of opposed bag houses, to the main gas manifold servicing that end of the bag houses, and to the other modules in an end-to-end configuration. Each module incorporates a section of the reverse air manifold and valved passages for connection of the bag houses to either the main gas manifold or the reverse air manifold. Combining the reverse air manifold sections and the valved passages into one compact passage greatly reduces the installation costs. (Author summary modified)

59061

APTIC NO. 82016

Smith, James Robert and John Pierce Kendall

COMBUSTOR AND METHOD OF ELIMINATING ODORS USING THE SAME. (*Northern Natural Gas Co., Omaha, Nebr.*) U. S. Pat. 3,904,351, 7p., Sept. 9, 1975. 6 refs. (Appl. Sept. 13, 1974, 6 claims).

A combustor for the elimination of odorous compounds in waste gases is described that does not require expensive and heavy refractory materials in its construction. The device consists of an elongated cylindrical stack open at the upstream end to allow for the entry of odorous materials and also open at the downstream end to allow for the exit of burned gases through an effluent combustion tube housed within the stack which defines a burner zone and a secondary combustion zone. Means are also provided within the stack for injecting a combustible fuel and air into the burner zone and for injecting air into the space between the stack and the tube. The effluent combustion tube has openings formed in it at the secondary combustion zone for allowing the passage of air through the tube into the secondary combustion zone at an angle of about 90 deg to the flow of gases within the secondary combustion zone. The burner zone includes an expansion zone, several radially extending inclined swirl blades downstream of the expansion zone, and a primary combustion chamber in which the mixture is ignited and from which it moves into the secondary combustion zone and then out the downstream end of the stack following complete combustion. (Author summary modified)

59062

APTIC NO. 80938

Smith John W. and Frank P. Palumbo

A SOLID WASTE RESOURCE RECOVERY SYSTEM. (*Memphis State Univ., Tenn. and City of Memphis, Dept. of Public Works, Convers. Refuse Energy Init. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 262-267. (Nov. 3-5.)*)

A resource recovery system for the disposal of municipal solid and liquid wastes in Memphis, Tenn. is discussed. The system will prepare a refuse derived fuel (RDF) and separate ferrous metals and nonferrous inorganic materials which can be sold to secondary material industries. The disposal system will op-

CONTROL METHODS

timize the collection of the refuse by the use of compaction-transfer stations. Once the preparation of the RDF and the burning of this material in the Allen power plant begins, no additional auxiliary fuel is required even though the processing is a wet preparation system. The system provides a coal replacement for approximately 540 ton of coal for each 2000 ton of refuse processed.

59063

APTIC NO. 84391

Smith, William H. and Leon S. Dochinger

CAPABILITY OF METROPOLITAN TREES TO REDUCE ATMOSPHERIC CONTAMINANTS. Preprint, Yale Univ., New Haven, Conn., School of Forestry and Environmental Studies and Forest Service, Delaware, Ohio, Northeastern Forest Experiment Station, 29p., 1975. 78 refs. (Presented at Better Trees for Metropolitan Landscapes Symposium, Washington, D. C., Nov. 5, 1975.)

Evidence indicating that trees in urban environments may have considerable potential for removing both particulate and gaseous pollutants from the atmosphere is reviewed. Studies of uptake and removal mechanisms are discussed in relation to nitrogen oxides, sulfur oxides, carbon monoxide, hydrogen fluoride, chlorine, nitrates, ozone, peroxyacetylnitrate, fluorine, and heavy metals. Mechanisms for gaseous removal include uptake via plant pores and surface adsorption. Particulate removal by trees may result from sedimentation or impaction onto tree surfaces and precipitation transfer to tree surfaces. Sufficient potential for this sink function is indicated to justify its consideration in tree selection and breeding programs for metropolitan trees.

59064

APTIC NO. 82985

Smith, Wayne L.

AIR FILTER WITH BAGS. (Mine Safety Appliances Co., Pittsburgh, Pa.) U. S. Pat. 3,871,848. 5p., March 18, 1975. 7 refs. (Appl. Sept. 24, 1973, 6 claims).

A low cost bag filter is described which can be assembled quickly, which is compact for storage and shipping or disposal, and which has only a single narrow frame. A row of filter bags disposed side by side extend rearwardly from a rectangular frame. Spaced parallel intermediate channel members clamp together adjoining sides of the open rectangular front ends of the bags, with the ends of the channels overlapping the front surfaces of flange members projecting inwardly from two opposite sides of the frame. Similar channel members are clamped onto the outer sides of the open ends of the two outermost bags and extend along the front surfaces of the flange members at the other two sides of the frame. This last pair of channel members is held in place with the adjoining areas of the outermost bags. The portions of the bags that span the spaces between the opposite ends of the channel members overlapping the front surfaces of the first mentioned pair of flange members are pulled into sealing engagement with those flanges when the bags are inflated behind the frame. (Author abstract modified)

59065

APTIC NO. 82161

Smithson, Harold R. and Jerry Allen Stirton

METHOD AND APPARATUS FOR EXCHANGING CATALYST IN A CATALYTIC CONVERTER. (Oxy-Catalyst, Inc., West Chester, Pa.) U. S. Pat. 3,911,971. 6p., Oct. 14, 1975. 6 refs. (Appl. March 8, 1974, 10 claims).

A system for emptying and refilling the catalyst pellet bed area of a catalytic converter for internal combustion engines is described that does not require the employment of gravitational flow in the operation. The system consists of a shell having a pair of grids therein defining a catalyst pellet area through which exhaust gases flow from the internal combustion engine. The pellet bed area has a fill port which is normally closed by a fill plug. When the catalyst pellets become contaminated, the fill plug is removed, and a tubular wand is

inserted through the hold. A negative pressure is applied through the wand to the pellet bed area, and the contaminated pellets are sucked out through the wand into a collection canister until the bed area is empty. An adapter having an opening therethrough is inserted into the tail pipe of the exhaust system to refill the bed area. The wand is removed from the adapter of the first line; and the line is transferred from the fill port, with the adapter being connected to the exhaust adapter. A fill adapter is inserted into the fill plug, and a second line is connected to the fill adapter. The opposite end of the second line is inserted into a supply of fresh catalyst. Negative pressure is applied through the first line to the exhaust pipe which sucks the fresh catalyst pellets through the second line into the catalyst bed. (Author abstract modified)

59066

APTIC NO. 80093

Smithson, I. K.

FUEL AND ENERGY ECONOMY IN INDUSTRY -- A REVIEW OF THE MAJOR AREAS FOR INVESTIGATION. Trans. Brit. Ceram. Soc., 74(6):203-212, 1975. 13 refs.

The major areas in Great Britain where fuel and energy savings may be made are discussed, with emphasis on fuel change. The fuels include solid, liquid, and gaseous fuels, and electricity. The major problem of coal is the ash content, which can limit direct firing applications and requires some exhaust gas cleaning in order to conform to emission standards. The sulfur content of fuel oil (3.5% in the heavy grades) can restrict usage where the gaseous atmosphere is important and can give rise to cold end acid corrosion problems. Natural gas is very clean with no harmful constituents such as sulfur, chlorine, or vanadium, and with efficient combustion should give no solids emission problems. Other areas include: thermal efficiency of processes, space heating, and steam distribution; waste heat; efficient use of electricity; and on-site energy integration.

59067

APTIC NO. 82741

Snow, Richard H., James H. Huff, and Werner Boehme

OPTIMIZING WET SCRUBBER SYSTEMS FOR ODOR CONTROL IN THE RENDERING INDUSTRY. Preprint, Purdue Univ., West Lafayette, Ind., 30p., 1975. 3 refs. (Presented at the Purdue Air Quality Conference, Annual, 14th, Indianapolis, Ind., Nov. 12, 1975.)

Field tests with spray scrubbers and packed-bed scrubbers installed at rendering plants revealed that odor reductions of 90-95% can be achieved. Multiple stages of alkaline sodium hypochlorite were found to be the most efficient scrubbing combination. Scrubber performance models were developed to optimize scrubber design. The optimum design for all conditions was a multiple-stage scrubbing unit, reflecting the significant chemical cost savings with multiple-stage units. A three-stage unit is economically justifiable when the average inlet odor level is greater than 1000 odor units; below this odor level, a two-stage unit is recommended. (Author summary modified)

59068

APTIC NO. 82890

Snyder, Clyde A.

BAG FILTERS. (Wheelabrator-Frye, Inc., New York) U. S. Pat. 3,877,901. 8p., April 15, 1975. 4 refs. (Appl. May 29, 1973, 6 claims).

A filter apparatus is described which makes use of one or more filter bags suspended within a filter housing. There is a shaking mechanism for shaking the bags during discontinuance for filter flow to effect displacement of filter solids collected on the ingoing side of the filter bag. In addition to the tube hook suspending the filter bags, at their upper ends to the shaking mechanism, boot straps are provided interconnecting the shaking mechanism with intermediate portions of the filter bags for increasing the magnitude and force of the treating operation as compared to conventional filters. (Author abstract modified)

59069

APTIC NO. 80263

Snyder, R. B., W. I. Wilson, G. J. Vogel, and A. A. Jonke
SYNTHETIC ADDITIVES FOR SO₂ REMOVAL FROM COMBUSTION GAS IN A FLUIDIZED-BED COAL COMBUSTOR. Preprint, Argonne National Lab., Argonne, Ill., 5p., 1975. 12 refs. (Presented at the National Conf. Energy and Environment, 3rd. Sept. 29-Oct. 1, 1975.)

Calcium oxide supported on alpha aluminum oxide was studied as an additive to replace particulate limestone or dolomite for removing sulfur dioxide from the gas in a fluidized bed coal combustor. The additive was prepared by soaking alumina pellets in calcium nitrate solution, then drying and calcining the pellets. The finely divided CaO and Al₂O₃ form uniformly distributed calcium aluminates. These react with SO₂ and oxygen, forming calcium sulfate, which can be regenerated using a reducing gas. The SO₂ capture rate by the additive was investigated, using a thermogravimetric analyzer. The sulfation rate was 0.7 order with respect to SO₂ concentration (0.05 to 3%) and 0.1 order with respect to O₂ (0 to 3%) when in excess. It increased with temperature up to 900 C, where it became independent. Dolomite was sulfated for comparison. The rate was higher for the supported additive, using 98% of the calcium; dolomite utilized 60% of its calcium before reaction virtually stopped. The regeneration rate of the sulfated additive was studied at 1100 C. It was essentially first order for all gases and very rapid. It was three times faster with hydrogen or methane than with carbon monoxide. The temperature effect was determined using a mixture of the gases. The supported additive regenerated slightly faster than dolomite, producing calcium aluminates. Sulfated dolomite regenerated to 50% calcium sulfide and 50% CaO. Equations are presented quantifying the sulfation-regeneration kinetic data. No decrepitation of calcium loss occurred when the pellets were fluidized with air at 900 C. (Author abstract)

59070

APTIC NO. 81980

Sohr, R. T.

GENERAL DISCUSSION ON ODOR ABATEMENT EMPHASIZING CHEMICAL ABSORPTION TECHNIQUES. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., East Central Section, 16p., 1975. (Presented at the Air Pollution Control Association, East Central Section Meeting, 32nd, Dayton, Ohio, Sept. 19, 1975.)

An odor is a chemical stimulus which causes a chemical reaction to take place in the human body, the measuring device being the nose. Methods of odor control are discussed. Chemical reactions to remove odor are becoming the accepted standard in many industries due to high efficiency and low operating costs. Chemical absorption should be considered as a means of controlling specific air emission problems.

59071

APTIC NO. 82206

Sola, Alberto

FUEL INJECTION PLANT FOR INTERNAL COMBUSTION ENGINES. (Fiat Societa per Azioni, Turin (Italy)) U. S. Pat. 3,903,852. 9p., Sept. 9, 1975. 6 refs. (Appl. Oct. 24, 1973, 4 claims).

A fuel injection unit for internal combustion engines is described. It includes a fuel metering device with a freely displaceable metering plunger means, the travel of which is controlled by an adjustable stop means. The injection unit comprises a distributor means, sensing means responsive to parameters representative of the functioning of the engine or influencing it, transducer means converting the parameters into electric signals, an electronic control device elaborating an analogous signal, a means to emit an electric signal corresponding to the position of the adjustable stop, a comparator circuit to compare the two electric signals, and an electric motor controlled by the comparator circuit to adjust the stop means. (Author abstract modified)

59072

APTIC NO. 82678

Solem, Edward L.

ROTARY ENGINE. (Assignee not given.) U. S. Pat. 3,877,848. 7p., April 15, 1975. 4 refs. (Appl. Dec. 5, 1973, 5 claims).

A rotary engine is described which consists of a trilobe rotor mounted for rotation in a trochoidal chamber with opposed inlet and outlet ports. The ports are of a unique configuration located in the end walls of the trochoidal chamber for coaction with complementary propellant gas entrapment channels. Unlike other engines, the output torque and efficiency of this engine may be varied for a given gas pressure by varying the size of gas inlet ports. Where constant torque operation is desired or where the engine is used with variable pressure steam sources, a fixed size inlet opening is used to advantage with the unique inlet and outlet port geometries of the invention which coact with flow channels in ends of the rotor. A unique accelerator slider valve located in the end walls of the trochoidal chamber permits variable timing of the engine. (Author abstract modified)

59073

APTIC NO. 83235

Solomatina, V. I., S. V. Poradek, D. T. Karpukhovich, and I. V. Kukushkin

EFFICIENT DESIGN OF A DUST SEPARATOR FOR ASPHALT-MELTING PLANTS. (Effektivnaya konstrukt-siya pyleulavlivayushchego oborudovaniya na ABZ.) Text in Russian. Avtomob. Dorogi, 38(9):27, Sept. 1975.

A system has been designed which contains a first-quality flue gas pump-dust collector and an external recirculation cyclone. The apparatus combines a draft-blast machine and the first inertial system of dust collection. The flue gas pump-dust collectors have been tested in working conditions and have shown a high degree of efficiency in cleaning gases (85-92 percent). Due to significant abrasion of some elements, the apparatus was reconstructed.

59074

APTIC NO. 76336

Somekh, G. S.

WATER-PYRIDINE AZEOTROPE IS AN EXCELLENT RANKINE CYCLE FLUID. J. Eng. Power., 97(4):583-588, Oct. 1975. 3 refs.

Physical and thermodynamic properties of the water-pyridine system are discussed in relation to its use as a Rankine cycle fluid. The azeotrope containing 40 wt% water has an excellent balance of properties. It has outstanding thermal stability and an excellent temperature entropy diagram. High cycle efficiency is obtained with a generator. The azeotrope has very good heat transfer properties and low corrosivity both on steel at high temperatures and aluminum at condenser temperatures. Aqueous pyridine has low pour points, and moderate flammability. (Author conclusions modified)

59075

APTIC NO. 82660

Spain, Raymond G.

CARBON FIBER ELECTRODES FOR ELECTRICAL PRECIPITATORS. (Assignee not given.) U. S. Pat. 3,883,328. 4p., May 13, 1975. 3 refs. (Appl. Nov. 29, 1973, 3 claims).

A collecting electrode for electrical precipitators is described. It consists of a batt of carbon filters used to remove sub-micron size dispersoids from gases treated in an electrical precipitator. One form of the C fiber electrode provides for the thermo-oxidative removal of some types of organic dispersoids from the electrode. (Author abstract modified)

59076

APTIC NO. 84458

Spaite, Paul W.

LIQUEFACTION AND GASIFICATION OF SOLID FUEL PROSPECTS FOR PRODUCTION OF SYNTHETIC BOILER FUELS FROM COAL. Preprint, Economic

CONTROL METHODS

59081

Commission for Europe, 9p., 1975. (Presented at the Desulfurization of Fuels and Combustion Gases Seminar, 2nd, Washington, D. C., Nov. 11-20, 1975.)

The applicability of liquefaction processes for production of power plant fuels is limited by demands from other markets such as transportation. The rate at which a synthetic fuels industry can be developed is controlled by non-market considerations. Synthetic fuels are likely to go to markets which are best suited for absorbing the high cost of synthetic fuels. The utility companies may find flue gas desulfurization cheaper than liquefied coal products despite the overall attractiveness of using clean fuel produced off-site. (Author conclusions modified)

59077

APTIC NO. 82254

Spielberg, David H., Roy E. Svacha, Kenneth R. Janowski, and George L. Hervert

OXYGEN SENSOR FOR AUTOMOTIVE USE. (Universal Oil Products, Co., Des Plaines, Ill.) U. S. Pat. 3,909,385. 5p., Sept. 30, 1975. 7 refs. (Appl. Sept. 4, 1973, 8 claims).

The control of automobile exhaust emissions is discussed. Oxides of nitrogen are formed under different engine operating conditions than carbon monoxide and excess hydrocarbons. Consideration is given to ways of reducing all three noxious elements to a satisfactory level. One way is to run the engine rich and pass the exhaust gases through a first catalyst to reduce the nitrogen oxides, then add secondary air to the exhaust gases and pass them through an oxidizing catalyst to convert the CO and hydrocarbons to carbon dioxide and water. The dual catalyst system is not only relatively costly, but is also quite wasteful of fuel. A single catalyst is capable of controlling all three exhaust components if the engine can be operated with an air/fuel ratio which is stoichiometric or just on the rich side of stoichiometric. The carburetors and fuel injection systems which are presently available cannot continually deliver a precise air/fuel ratio to the engine under varying operating conditions. By utilizing an oxygen sensor in combination with a closed loop control system it is possible to control the fuel or air input to the engine or to the catalyst convertor so that the air/fuel ratio can be precisely controlled.

59078

APTIC NO. 82587

Spigt, C. L. and A. Daniels

THE PHILIPS STIRLING ENGINE: A PROGRESS REPORT. Preprint, Philips Research Labs., Eindhoven (Netherlands) and Philips Labs., Briarcliff Manor, N. Y., 8p., 1975. 9 refs. (Presented at the Intersociety Energy Conversion and Engineering Conference, 10th, Newark, Del., Aug. 18-22, 1975.)

Progress with the development of the Philips Stirling engine is reviewed. The Stirling engine operates on external combustion (the heat required by the cycle is transferred continuously to the working gas through a wall) and is thermally very efficient and relatively pollution-free. Currently two methods are being used by Philips to mechanize the Stirling cycle: rhombic drive and swashplate drive. The engine can be adapted to work with various fossil fuels, radioisotopes, chemical combustion, and other unconventional heat sources. Combustion efficiencies of 85% and better are being obtained with fossil-fueled engines used in conjunction with rhombic and swashplate drive. Tests are currently being performed on a 4-cylinder, single-acting, 200 horsepower engine installed in a bus and on a swashplate driven, double-acting passenger car engine with 170 brake horsepower.

59079

APTIC NO. 82603

Squires, Arthur M.

THE CITY COLLEGE CLEAN FUELS INSTITUTE: PROGRAMS FOR (I) GASIFICATION OF COAL IN HIGH-VELOCITY FLUIDIZED BEDS AND (II) HOT GAS CLEANING. Preprint, Inst. of Gas Technology, 51p., 1975. 54 refs. (Presented at the Institute of Gas Technol-

gy, Clean Fuels from Coal Symposium, Chicago, Ill., June 26, 1975.)

Methods for the gasification of coal in high-velocity fluidized beds and for the cleaning of hot fuel gas are reviewed. High-velocity fluidized beds (10-40 ft/sec) are being used successfully for the total gasification of coal with air and for the substantially total gasification of coal with steam and oxygen. Such beds also offer promise for partial gasification by flash pyrolysis at atmospheric pressure, partial gasification with steam at high pressure (20 atmospheres, for example) to yield a gas containing a large amount of methane, and partial gasification by flash hydrogenation (at 700 C and 100 atmospheres, for example) to yield methane, ethane, benzene, and a coke low in sulfur content. A fast fluidized bed of fine coke particles provides excellent contact between the solid and gasification medium. A panel bed filter with puffback cleaning appears capable of efficiently removing dust from a hot fuel gas. Charged with a solid that is absorptive toward hydrogen sulfide, the panel bed can remove both dust and sulfur. Half-calcined dolomite is a candidate solid for hydrogen sulfide absorption and can be regenerated for reuse by reconvertng calcium sulfide to calcium carbonate by the action of steam and carbon dioxide. Other candidate solids for the absorption of hydrogen sulfide from fuel gas at elevated pressure are an iron oxide and fly ash composite and fully-calcined dolomite. Candidate solids for the absorption of sulfur dioxide from combustion products are solids containing copper oxide and half-calcined dolomite. (Author abstract modified)

59080

APTIC NO. 82094

Staffin, Robert and Richard E. Tkac

STEPPED DISTRIBUTOR PLATE FLUIDIZED BED REACTOR. (Hercules Inc., Wilmington, Del.) U. S. Pat. 3,915,657. 6p., Oct. 28, 1975. 3 refs. (Appl. May 21, 1974, 3 claims).

A fluidized bed reactor is described which contains a stepped distributor plate having at least two fluidizing surfaces, one spaced below the other. This distributor plate permits improved distribution of feed over the fluidizing surfaces of the plate. Feed position between fluidizing surfaces avoids pyrolysis of the feed and subsequent clogging of the feed tube. (Author abstract modified)

59081

APTIC NO. 73325

Stahl, Guenter

FIRST TEST RESULTS ON A NEW STRATIFIED CHARGE SYSTEM FOR RECIPROCATING SPARK IGNITION ENGINES. (Erste Versuchsergebnisse mit einem neuartigen Schichtladungsverfahren fuer Hubkolbenmotoren mit Fremdzundung). Text in German. Motortech. Z. (Stuttgart), 36(4):95-102, 1975. 10 refs.

Measurements were made on an air-cooled test engine equipped with a novel stratified charge system accomplished by very simple means. To achieve a charge stratification, a single mixture formation unit was used, consisting of a low pressure injection valve inserted into the intake duct. The fuel is injected at a certain point within the suction stroke. The test engine is a modified single-cylinder diesel engine, using other commercially available parts and could therefore be run only to 3000 rpm. On regular fuel and with the compression ratio 9.2:1 it was possible to achieve distinctly better coordinated figures for fuel consumption, mean effective pressure, and specific output than those of other known stratified charge systems. A comparison with the results received some time ago on a swirl-chamber type stratified charge engine has been conducted. A soft and knock-free combustion process could be maintained throughout a wide range of performance controlled by mixture composition only because, unlike other known systems, the new method makes it possible to utilize a substantially longer period of time for generating the combustible mixture by injecting the fuel during the second half of the intake stroke. The carbon monoxide and nitrogen oxide emissions experienced over the entire meaningful range of the fuel-

air ratio are lower than the figures published for other stratified charge engines. As for the hydrocarbon emissions, even the most simplified test engine set-up has been capable of yielding better results in the range of up to 50% excess air. Possible steps to further develop the new stratified charge system employing reasonable acceptable technical means are discussed.

59082

APTIC NO. 81848

Stambaugh, E. P., J. F. Miller, S. S. Tam, S. P. Chauhan, H. F. Feldmann, H. E. Carlton, J. F. Foster, H. Nack, and J. H. Oxley

ENVIRONMENTALLY ACCEPTABLE SOLID FUELS BY THE BATTELLE HYDROTHERMAL COAL PROCESS.

Preprint, Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., 11p., June 19, 1975.

The Battelle Hydrothermal Coal Process of coal desulfurization is described. The process entails five major steps: coal preparation, hydrothermal treatment, fuel separation, fuel drying, and chemical leachant regeneration. The process is capable of extracting up to 99% of the pyritic sulfur and up to 70% of the organic sulfur in coal. Its primary end products are clean solid fuel and elemental sulfur. The latter can be marketed or easily stored. The process is economically competitive with other desulfurization processes and possesses the advantage of producing no significant amount of sludge for disposal. The process is essentially a closed-loop operation and thus possesses low pollution potential.

59083

APTIC NO. 82419

Starbuck, Herman S.

ELECTROSTATIC PRECIPITATOR. (Assignee not given.) U. S. Pat. 3,898,060. 11p., Aug. 5, 1975. 5 refs. (Appl. Jan. 28, 1974, 15 claims).

An electrostatic precipitator that continuously removes particulate matter while allowing certain sections to be simultaneously cleaned is described. Unlike prior art precipitators which direct the cleaning solution in a path parallel to the surface of the plates, the present invention achieves more efficient cleaning by directing the cleaning solution radially into the electrodes. The precipitator consists of several duplicate precipitator cell sections which are enclosed by a housing having a first chamber which is in axial communication with some of the cells and a second chamber which is in radial communication with the other cells. Means are provided for generating an electrostatic field in the cells communicating with the first chamber and for deactivating and scrubbing the cells communicating with the second chamber. (Author abstract modified)

59084

APTIC NO. 84447

Stark, S. B., N. I. Kharichev, and V. V. Belousov

SUPPRESSION OF DUST EMISSION WITH STRONG ELECTRICAL FIELDS AT HIGH TEMPERATURES.

PART 2. (K voprosu podavleniya plyevynosa sil numi elektricheskimi polyami pri vysokikh temperaturakh. Soobshchenie 2). Text in Russian. Izv. Vysshikh Uchebn. Zavedenii, Chernaya Met., no. 3:179-182, 1975. 6 refs.

The temperature-dependence of the escape coefficient and the total corona current, obtained on the high-temperature electrical cleaning rig for open-hearth furnace dust at the Moscow Steel and Alloys Institute, are given. The escape coefficient showed a sharp decrease in the temperature range between 200 and 500 C, and a high escape rate due to the moisture content of the dust was observed at temperatures below 200 C. The escape coefficient decreased sharply with increasing corona discharge voltage, especially at flow rates below 1 m/sec. The rate of escape increased with increasing gas flow rate. Electrical fields can be used to suppress or reduce the escape of particulate matter from mechanical dust separators, from technological equipment, and also for the preliminary treatment of dust-laden waste gases.

59085

APTIC NO. 81997

Stautzenberger, Adin Lee

ABSORBING SO₂ WITH POLYACRYLIC ACID SOLUTION. (Celanese Corp., New York) U. S. Pat. 3,907,972. 4p., Sept. 23, 1975. 5 refs. (Appl. April 30, 1973, 6 claims).

An absorption process for the removal of sulfur dioxide from gas mixtures is described which is characterized by low cost, high efficiency, and ease of operation at low temperatures. An aqueous solution of a polyalkenoic acid such as polyacrylic acid or polymethacrylic acid having a molecular weight of at least 200 and preferably below 6000 comprises the improvement of the process. The aqueous solution is maintained at a pH of about 3.2-4. Sulfur dioxide is removed from the absorbing solution almost quantitatively along with hydrogen sulfide, with sulfur being produced in the reaction. (Author abstract modified)

59086

APTIC NO. 82566

Steelhammer, J. C., D. R. Nogash, F. J. Mangravite, A. J. Graffeo, J. P. Terry, and W. L. Harpel

EFFECT OF CHEMICAL ADDITIVES ON ELECTROSTATIC PRECIPITATOR PERFORMANCE. Preprint, Purdue Univ., West Lafayette, Ind., School of Civil Engineering and the Indiana Air Pollution Control Board, 24p., 1975. 11 refs. (Presented at the Purdue Air Quality Conference, Annual, 14th, Nov. 12-13, 1975.)

Field evaluations of the effect of various chemical additives on electrostatic precipitator performance were performed. The coal used throughout the experiments contained between 2 and 3% sulfur, 20-25% ash, and 5-7% moisture. The chemical additives were fed to the flue gas as aqueous solutions, and the chemical feed system consisted of several air atomizing spray nozzles. The chemical additives were fed to the flue gas for approximately 1-3 hr before particulate sampling was started. Increases in precipitator collection efficiency were obtained with one organic and two inorganic additives. Efficiencies of 96.4%, 95.3%, and 94.9%, respectively, were obtained with the additives as compared to a control efficiency of 91.9%. The increased efficiencies appeared to be due to space charge effects and cohesivity modification.

59087

APTIC NO. 82836

Stenzel, Jeurgan

PROCESS FOR REMOVING NITROGEN OXIDES FROM EXHAUST GASES. (Assignee not given.) U. S. Pat. 3,880,982. 4p., April 29, 1975. 10 refs. (Appl. Dec. 26, 1972, 13 claims).

A process for removing nitrogen oxides from exhaust gases of internal combustion engines or from exhaust gases obtained in the production of nitric acid is described. The NO_x are reduced to nitrogen with the use of a gaseous reductant, in contact with a catalyst, and at elevated temperatures. The nitrogen oxide containing gas in admixture with at least stoichiometric proportions, based on the nitrogen content of the gas, of hydrogen and/or carbon monoxide and/or gaseous hydrocarbon reductants, is contacted at temperatures substantially between 150 and 1100 C, with a catalyst consisting of a homogeneous mixture of oxides and/or aluminates of copper, nickel, and manganese. (Author abstract modified)

59088

APTIC NO. 83211

Stephens, Ruth E.

EXHAUST GAS CATALYST SUPPORT. (Ethyl Corp., Richmond, Va.) U. S. Pat. 3,899,444. 9p., Aug. 12, 1975. 4 refs. (Appl. Dec. 22, 1972, 42 claims).

A catalyst support which reduces the hydrocarbons, carbon monoxide, and nitrogen oxides in the exhaust of internal combustion engines is described. The support consists essentially of an alumina coating on an inert substrate. The alumina coating has a rare earth metal oxide substantially uniformly dis-

CONTROL METHODS

59095

tributed throughout. Catalyst compositions utilizing this support, processes for preparing both support and catalyst, and a method of treating internal combustion engine exhaust gases and preventing crystallization of alumina are described. The catalysts consist essentially of an alumina matrix containing rare earth metal oxide and a catalytic metal oxide. Unlike other catalysts, this catalyst support is thermally stable and attrition resistant. (Author abstract modified)

59089

APTIC NO. 82988

Stewart, Earl A. and William Joseph Gaboury

SOLID WASTE INCINERATOR. (Assignee not given.) U. S. Pat. 3,882,802. 6p., May 13, 1975. 3 refs. (Appl. May 20, 1974, 10 claims).

A solid waste incinerator suitable for municipal, commercial, and industrial installations is described. It is designed to handle large units of solid waste as such as crushed car bodies, chesterfields, mattresses, and bulky trash. The incinerator is in the form of a rotatable open ended horizontal drum. Near one open end the drum retort is fired by fuel burners. The products of combustion are discharged from the opposite open end. Fly ash is electromagnetically trapped and residual combustible gases are subject to subsequent burning in a Dutch oven to reduce emission of smoke, offensive odors, and deleterious air pollutants. Automatic controls monitor the loading, locking, opening, closing, and locking the doors, firing the burners, and rotating the drum in the required succession. Non-combustible content of the waste is emptied onto an inclined gate for sorting, screening, sluicing, and retrieval. Heat produced in the incinerator may be utilized.

59090

APTIC NO. 84058

Stipek, J. W.

RECOVERY OF HEAT WHEN DRYING CARDBOARDS.

(Die Rueckgewinnung von Waerme beim Trocknen von Pappen). Text in German. Papier (Darmstadt), 29(12):563-570, 1975.

A pasteboard drier, equipped with spent air humidity controls and generating 800 kcal/kg water is combined with a waste heat recovery system transferring 440,000 kcal/hr to water heaters. This is comparable to 10 kg light oil. Unequipped driers operating at 1000 kcal/kg H₂O, when covered, reduce energy expenditure to 760 kcal/kg or 176 kg light oil. A recovery capacity of 320,000 kcal/hr is possible when fresh air is heated in the air-air step of the spent air heat exchanger. Substantial cost cutting up to 50% may be achieved in this manner. Hourly, 96 kg light oil are saved, (about \$8.00 for oil prices at 0.6/liter/dollar). In the winter, this amounts to \$24,000.00 (25/days/month/5 month).

59091

APTIC NO. 80323

Stoehr, R. A. and J. P. Pezze

EFFECT OF OXIDIZING AND REDUCING CONDITIONS ON THE REACTION OF WATER WITH SULFUR BEARING BLAST FURNACE SLAGS. J. Air Pollution Control Assoc., 25(11):1119-1122, Nov. 1975. 10 refs.

The effect of oxidizing and reducing conditions on the reaction of water with sulfur bearing blast furnace slags was investigated. The evolution of hydrogen sulfide and sulfur dioxide from hot blast furnace slags by reaction with water is dependent upon the presence of oxygen or hydrogen in the reaction zone as well as on the temperature. Hydrogen produces a small increase in H₂S and a small decrease in SO₂ emission, while O₂ produces a very great inhibiting effect on H₂S emission and only a small increase in SO₂ emission. The total emission of sulfur bearing gases is much less when water and air is blown at the slag than when water and argon is blown at the slag, particularly at 1200 C and above. These effects are useful in attempts to design systems for slag quenching which will produce less pollution. (Author abstract modified)

59092

Stoenner, Alfred

WASTE GAS DESULFURIZATION IN POWER PLANTS. RECYCLING OF SULFUR PRODUCTS, CLEAN GAS AND ADDITIVES TO CONSTRUCTION MATERIAL. (Abgasentschwefelung in Kraftwerken. Wiederverwendung von Schwefelprodukten, Reingas und Baustoff-Additiven). Text in German. Tech. Umweltmag., vol. 6:37, Dec. 1975.

A brief review is given of the Reinluft, Bergbauforschung, Monsanto Cat-ox, Uhde, Wellman-Lord, Bischoff, CE-EVT and Hoelter flue gas desulfurization methods. Intense studies are being conducted into the possibilities of utilizing the by-products, such as calcium sulfate and calcium sulfite, as generated by the different desulfurization processes.

59093

APTIC NO. 83186

Stolyarov M. M. and V. P. Grigorov

AIR POLLUTION PREVENTION DURING ELECTRICITY GENERATION BY NUCLEAR POWER PLANTS.

(Zashchita vozduhnogo basseyna pri proizvodstve elektroenergii na AES). Text in Russian. Teploenergetika, no. 4:7-9, April 1975. 6 refs.

The advantages of pollution-free big nuclear power plants and different methods of gas and air decontamination are discussed. There are two major techniques currently used for the purification of the technological gases consisting primarily of nitrogen with water vapor impurities, radioactive noble gases, and iodine compounds. The extensive method involves long-term keeping in gas holders and has several disadvantages (the danger of fire-damp formation, sharp increase of gas holder volumes due to the dilution of the gases by nitrogen). The intensive method of sorption of radioactive gases by activated carbon is more promising. Diagrams are presented for purification of gas both by the dilution of hydrogen by nitrogen and the dilution of H by vapor. For the purification of the air in the building, use is made of fine-fiber prechlorvinyl, acetyl cellulose, and asbestos cellulose filters. The purification of the air inside the building of nuclear plants is done by ventilation systems of two types: recirculating (coefficient of purification does not exceed 85-90%) and direct-flow. The gas purification systems employing sorption of radioactive noble gases by activated carbon can be further improved by the use of cryogenic distillation, selective separation of gases by semi-permeable membranes, and selective adsorption by organic solvents. The use of iodine and aerosol scrubbing in the recirculating ventilation systems seems to be most advantageous.

59094

APTIC NO. 81989

Straitz, John F., III.

VAPOR DISPOSAL SYSTEM. (Combustion Unlimited Inc., Elkins Park, Pa.) U. S. Pat. 3,914,095. 10p., Oct. 21, 1975. 7 refs. (Appl. Sept. 16, 1974, 23 claims).

A method for the collection and disposal of hydrocarbon vapors escaping during vehicle fuel tank filling, tank truck loading, and other storage and dispensing operations is described which avoids flash back and other explosion hazards associated with prior art vapor disposal systems. The system consists essentially of a pump for the delivery of liquid to a tank, a combustible vapor collector pipe associated with the tank for the collection of vapors displaced therefrom under pressure by liquid introduced into the tank, and a combustion chamber for the disposal of the vapors. Means are also provided for inactivating the pump when the temperature of the combustion chamber exceeds a predetermined limit.

59095

APTIC NO. 76556

Strauss, Hans-Jochen

CLEAN AIR MAINTENANCE: FINE DUST EMISSIONS CAN BE CONTROLLED. (Luftreinhaltung: Emissionen im Feinstaubbereich können beherrscht werden). Text in German. Umwelt (Duesseldorf), 4(8):33-34, 36, 1975. 1 ref.

Fine dust, according to a definition adopted in West Germany, is dust of under 0.01 mm particle size, for example, the dust found in the waste gases from metallurgical processes. In the case of electric arc furnaces for melting and refining of steel, one of the latest methods of dust extraction is to suck the waste gases out of the furnace body through a special opening in the furnace top and lead them through an electrostatic precipitator for removal of the dust. The quantity of dust generated amounts to 1 to 2% of the steel produced. In the case of salt fumes which develop when burning off varnish coatings in a salt bath, or at salt bath hardening processes, the fine dust is a particle dispersion of partly hygroscopic salts. In these cases, wet separation is indicated, with the venturi scrubber being the preferred type of equipment. Recirculation of the water used makes the process economical. A third basic method of fine dust separation is by special filtration processes.

59096

APTIC NO. 83714

Strauss, Hans-Jochen

EMISSIONS OF FINE DUST PARTICLES CAN BE CONTROLLED. (*Emissionen im Feinstaubbereich koennen beherrscht werden*). Text in German. *Umwelt (Duesseldorf)*, 5(4):33-36, 1975. 1 ref.

A discussion on the controlled emission of fine dust particles under 0.01 mm in industrial manufacturing processes such as emulsion and coolant dispersion in sheet metal and foil rolling and in textile coating is presented. Even when problems of filtering out heavy condensation are considered, the emission of fine particles may be principally handled through the use of wet-screening scrubbers, filtration collectors and electrostatic dust precipitators. Difficulties in chemical engineering lie in the adaptation of the dust removal procedure to the technology of processes yielding exhaust fumes and spent air. Its properties (temperature, composition, dew point) and those of the particulate material (combustibility and the hygroscopic, adhesive, or corrosive properties) give indications as to which methods are unsuitable. With respect to cost analyses and recycling, new discussions may arise, especially those concerning spent air.

59097

APTIC NO. 79659

Strindehag, O.

A LIQUID COUPLED SYSTEM FOR HEAT RECOVERY FROM EXHAUST GASES. *Building Serv. Engr.*, vol. 48:52-56, June 1975. 5 refs.

The use of a liquid coupled system for heat recovery from exhaust gases is discussed. The basic equations for the technical optimization are given, and a computer program is described which gives the optimum liquid flow, the temperature efficiency, and the pressure drops for three sizes of supply and exhaust air heat exchangers. A sub-program is described which can be used for calculation of the energy saving per year for different system efficiencies. The procedure for figuring out the profitability of the various alternatives is discussed.

59098

APTIC NO. 82253

Struble, Robert W. and John T. Eckstine

BAFFLE TYPE GREASE FILTER. (*Buildex Inc., Jericho, N. Y.*) U. S. Pat. 3,910,782. 7p., Oct. 7, 1975. 8 refs. (Appl. Sept. 27, 1973, 10 claims).

An improved filter device for separating entrained grease from a flow of air is described. Areas like commercial kitchens in which frying, deep frying, and to other similar procedures are practiced, are exposed to a grease laden atmosphere, whose continued presence is highly unsanitary and hazardous, due to the deposition and condensation of the grease on exposed surfaces. Grease-entrained air is a dangerous pollutant. The filter possesses a grease removing efficiency 50-100% greater than that of available baffle filters, with little increase in power requirements. The radical efficiency increase is achieved by reason of the high air flow velocity in the inlet passage

AIR POLLUTION ABSTRACTS, JUNE 1976

throats, which have a transverse cross section not exceeding one half of that of the inlet opening, and the unique sinuous passages interconnecting the inlet and outlet passages.

59099

APTIC NO. 82932

Strukl, Joseph Stephan

REDUCING DEPOSITS AND SMOKE FROM JET FUELS WITH ADDITIVES INCORPORATING AN AMMONIUM SALT. (*Standard Oil Co., Chicago, Ill.*) U. S. Pat. 3,883,320. 6p., May 13, 1975. 8 refs. (Appl. Dec. 7, 1972, 12 claims).

A method of reducing deposition and smoke from jet fuels with additives incorporating an ammonium salt is described. Smoke and ash deposit formation in commercial and military jet engines and power plants is minimized by inclusion in the fuel of an additive consisting of oil soluble salts of a transition metal, such as manganese or iron, and an alkaline earth metal together with an oil soluble ammonium salt. A preferred additive consists of methylcyclopentadienyl manganese tricarbonyl and calcium alkylphenol sulfide in amounts to provide a Mn/Ca weight ratio of 5:1. The dosage of the mixed metals is preferably within the range 200-600 ppm, with dosage of ammonium ion within the range 10-100 ppm. (Author abstract modified)

59100

APTIC NO. 82420

Stumpp, Gerhard

APPARATUS FOR THE INTERRUPTION OF FUEL SUPPLY IN AN INTERNAL COMBUSTION ENGINE. (*Robert Bosch G.m.b.H. Stuttgart (Federal Republic of Germany)*) U. S. Pat. 3,897,771. 7p., Aug. 5, 1975. 5 refs. (Appl. Oct. 2, 1973, 9 claims).

An apparatus for interruption of the fuel supply in an internal combustion engine during non-operation of the engine is described. It includes a battery operated fuel supply mechanism which operates independently of the engine. An ignition switch is operatively arranged to separate the fuel supply mechanism from the engine. An air quantity measuring device is located within the suction tube of the engine and is operatively arranged to close an electrical contact when in its rest position. In that position and whenever the ignition switch is also closed, a current path is completed between the battery and a relay which is biased mechanically by a spring. Whenever the relay is not energized and the ignition switch is also closed, a current circuit is completed between the battery and the fuel supply mechanism to effect delivery of the fuel to the engine. In other installations, the control signal producer (pressure, voltage) of the control medium is completely absent during the starting of the engine and also very often for a period immediately thereafter, especially under extreme operational conditions. (Author abstract modified)

59101

APTIC NO. 76504

Sugano, Shigemi and Zensuke Tamura

A MANUFACTURING METHOD FOR GRANULAR ACTIVATED CARBON. (*Zoryu kasseitan no seizo ho*). Text in Japanese. (*Hitachi Manufacturing Co., Ltd., Tokyo (Japan)*) Japan. Pat. Sho 50-21432. 1p., July 23, 1975. (Appl. Nov. 30, 1971, 1 claim).

A manufacturing method for granular activated carbon using approved fiber as the core material is described. Acid and heat resistant ceramic fiber and fused silica fiber can be used. It is chopped into activated carbon size and mixed with charcoal or powdered coke in the ratio of 1 to 9. To this mixture, a caking agent such as tar pitch is added. After drying, carbonization, and activation treatment, the granular activated carbon is obtained. The advantages of this activated carbon are high absorption efficiency and high strength. The latter was especially advantageous since ordinary carbon tends to become finer after several regenerations.

59102

APTIC NO. 82142

Sugier, Andre, Michel Prigent, and Georges Berrebi

CATALYTIC OXIDATION COMPOUNDS OF COMBUSTIBLE GASEOUS RESIDUES. (*Societe Pro-Catalyst, Rueil-Malmaison (France)*) U. S. Pat. 3,898,183. 4p., Aug. 5, 1975. 5 refs. (Appl. Oct. 30, 1973, 6 claims).

An improved oxidation catalyst for the removal of hydrocarbons and carbon monoxide from internal combustion engine exhaust is described. The catalyst is a physical mixture of at least two granular catalysts. An alumina or aluminum support of large specific surface area is used for one of the catalysts which consists of one or more metals of the platinum group. The second catalyst is formed on an alumina or aluminous support of small specific surface area and consists of one or more metal oxides. The support used for the platinum catalyst consists of at least 80 wt% of alumina with a specific surface area of between 40 and 120 sq m/g, and the support used for the metal oxide catalyst consists of at least 70 wt% of alumina with an average specific surface area of between 2 and 20 sq m/g.

59103

APTIC NO. 82510

Sultanov, M. Y. and A. V. Zaytseva

EFFECT OF SULFUR DIOXIDE ON CATALYSTS USED FOR WASTE GAS CLEANING. (*Vliyanie sernistogo gaza na aktivnost katalizatorov obezvezhivaniya*). Text in Russian. *Izv. Akad. Nauk Kaz. SSR, Ser. Khim.*, no. 5:28-31, Sept.-Oct. 1975. 9 refs.

The effect of sulfur dioxide in 0.1% concentration on the catalytic oxidation of carbon monoxide mixed with air and with automotive exhaust gases was studied on copper-oxide-chromic oxide, platinum, palladium, copper oxide, silver oxide, chromic oxide, nickel oxide, manganese sesquioxide, cobalt oxide (Co₂O₃), ferric oxide, and vanadium pentoxide at a bulk rate of 50,000/hr. Except for vanadium pentoxide, all catalysts showed an increase in CO oxidation temperature in the presence of SO₂. The reduction in the catalytic activity for CO was reversible by regeneration of the catalysts in air at temperatures of 600-900 C.

59104

APTIC NO. 83222

Suzukawa, Norikazu, Naoshi Kono, Kenji Terai, Shigeyuki Nakai, Yutaka Tamura, Shinko Ueda, Mitsuo Imaura, and Noritaka Yasunaga

DESULFURIZATION METHOD OF RESIDUE LIQUID TYPE HYDROCARBON. (*Jyushitsu ekiyo tanka suiso no datsuryu hoho*). Text in Japanese. (*Ube Industries, Ltd. (Japan)*) Japan. Pat. Sho 50-31882. 9p., Oct. 16, 1975. (Appl. April 9, 1971, 1 claim).

A desulfurization method for heavy liquid hydrocarbons such as heavy oil, crude oil, and residual oil is described. It is an improved continuous method and does not require conventional hydrogenation. The conventional hydrogenating type desulfurization method for heavy liquid hydrocarbons requires not only a great amount of hydrogen and catalysts but also shortens the service life of the catalysts due to carbons and tars adhering to the surfaces of the catalysts. The characteristic of the new method is a special desulfurization process using a fluidized bed, which consists of a first stage of partially combusting hydrocarbons in the forced circulated fluidized bed, a second stage which cools the decomposed products discharged from the first stage and removes tars and carbons, and a third stage which separates gas containing sulfur, refined liquid hydrocarbons, and heavy liquid hydrocarbons. The solid particles for the fluidized media are inorganic substances such as sand, cement clinkers, carbon black, alumina and alumina silica. The decomposition temperature is 650-1000 C.

59105

APTIC NO. 80008

Suzuki, G., R. Ando, H. Yoshikoshi, Y. Yamaoka, and S. Nagaoka

A STUDY OF THE REDUCTION OF NOX IN THE WASTE GAS FROM SINTER PLANT. (*Shokietsuki no haigasachu NOx no teigen ni kansuru kenkyu*). Text in Japanese. *Tetsu to Hagane (Iron Steel)*, 61(13):2775-2783, Oct. 1975. 21 refs.

The thermal nitrogen oxides formed in the sintering process were calculated by a simulation model. A sintering test was carried out in which the portion of nitrogen in the air was replaced with argon. It was confirmed that the NOx in the waste gas originated mainly from the nitrogen in the coke. Nitrogen in the ore was also converted to NOx; however, it constituted about 10% of the total nitrogen in the sinter mixture, so that the denitration of coke is necessary for the reduction of NOx from sinter plants. The ratio of denitration of coke increased with rising reheating temperature. The amount of NOx formed could be diminished to about 30% in sintering tests using this low nitrogen coke. (Author abstract)

59106

APTIC NO. 82394

Suzuki, Yoshinobu, Tomoaki Kajima, and Shusaku Saito

NO₂ ADSORPTION REMOVAL BY ACTIVATED CARBON. (*Kasseitan ni yoru NO₂ no kyuchaku jokyo*). Text in Japanese. Preprint, Society of Heating, Air-Conditioning and Sanitary Engineers of Japan, Tokyo, p. 153-156, 1975. (Presented at the Japan Society of Heating, Air-Conditioning and Sanitary Engineers, Annual Meeting, Tokyo, Japan, Oct. 13-14, 1975, Paper A-39.)

Adsorption removal of nitrogen dioxide by activated carbon, and conditions for generation of nitric oxide from the adsorbent were studied. Concentrations of NO₂ were maintained at 0.2 ppm, with different levels of relative humidity (RH), ranging from below 10% to above 90%. At RH below 30%, all the activated carbon samples released NO after 2 hours. With increase in RH and pH of the activated carbon, NO generation was suppressed, while a high removal rate of NO₂ occurred. At RH above 70%, hardly any NO generation occurred. The rate of adsorption and desorption of water was greatest at low RH (30%). Sixty minutes after initiation of H₂O adsorption, over 60% of the amount adsorbed at equilibrium was adsorbed. The corresponding state for H₂O desorption was reached 30 min after initiation of desorption. Generation of NO tended to increase with increasing temperature, and decrease with decreasing temperature. The removal rate for NO₂ remained nearly constant in the temperature range of 5-35 C, and for NO₂ inlet concentration range of 0.025-0.4 ppm, temperature 25 C, and RH 60%. As space velocities (SV) increased, NO₂ removal rate decreased. After 50 hours, NO generation was nil, and NO₂ removal rates reached constant values (60-90%) for NO₂ and NO inlet concentrations 0.2 ppm, RH 60%, temperature 21-23 C, SV 60,000-24,000/hr.

59107

APTIC NO. 82959

Suzuki, Yasu and Takeshi Atago

AN AIR PUMP WITH AUTOMATICALLY PROPORTIONED AIR SUPPLY FOR EMISSION GAS PURIFICATION OF AN AUTOMOTIVE ENGINE. (*Engin Kyu-nyu kukiryo hireigata ae pompu*). Text in Japanese. (*Hitachi, Ltd. (Japan)*) Japan. Pat. Sho 50-32693. 6p., Oct. 23, 1975. 1 ref. (Appl. Dec. 26, 1970, 2 claims).

An air pump for an air injection system to purify engine exhaust gas is described. Secondary air is injected for recombination of exhaust gas into the exhaust manifold, the reactor, and the converter, and the prescribed ratio of the exhaust emission gas to the injected air is maintained during all operational modes of the vehicle. This air pump allows effective recombination of the exhaust gas, and promotes highly efficient cleaning of the emission gas. The new process consists of various components which control the excess air proportionally according to the rotational speed of the engine and the pres-

sure of the manifold. There is a manifold pressure control system and an engine rotational speed control system which dump excess air beyond the amount of air required by each operational mode of the vehicle. The mechanically activated air pump is designed to supply the exhaust manifold with the exact amount of secondary air required at all engine speeds.

59108

APTIC NO. 82851

Swick, Robert M.

GAS TURBINE ENGINE CONTROL. (General Motors Corp., Detroit, Mich.) U. S. Pat. 3,899,886. 6p., Aug. 19, 1975. 6 refs. (Appl. Nov. 19, 1973, 5 claims).

An economical gas turbine engine control is described which is adapted for use in automobile power plants. Conventional devices are too expensive for this application. The control includes a fuel metering valve operated directly by the vehicle operator and a metering head regulating valve controlled electronically in response to engine operating parameters. Variable geometry means are provided in the engine to accommodate to varying airflow and power levels which are actuated by a servomechanism controlled by the position of the vehicle operator's power control. In the event of failure of the electronic controls, the metering head drops to a valve which is safe at any throttle opening but sufficient to run the engine. (Author abstract modified)

59109

APTIC NO. 79711

Tabasaran, Oktay

ENVIRONMENT BALANCES AND TRASH PYROLYSIS. (Umweltbilanzen bei der Abfallpyrolyse). Text in German. Muell Abfall, 7(5):127-131, 1975. (Presented at the Waste Technology Colloquium, 28th Stuttgart, West Germany, March 14, 1975.)

The environmental and energetical balances of trash pyrolysis according to the Destrugas and Goldshoe processes are drawn up on the basis of actual measurements on technical-scale pilot plants. The waste gases generated in the Destrugas degassing process at a pyrolytic temperature of 1000 C are scrubbed, and a fuel gas is obtained. With trash with a calorific value of 1900 kcal/kg, 360 kg of gas with a calorific value of 2790 kcal/N cu m are obtained per ton of trash. This gas contains 39.5% hydrogen, 17.6% carbon dioxide, 18.6% water, 21.1% carbon monoxide, 9% methane, and 3.2% other hydrocarbons by volume, as well as 404 mg sulfur oxides, 35 mg hydrochloric acid, 1 mg hydrofluoric acid, 170 micrograms mercury p-r N cu m, 400 ppm hydrogen sulfide, 59 ppm hydrocyanic acid, and 1185 ppm triethylamine. In the Goldshoe process, in which hydrocarbons are cracked at 1200 C in coke bed, and part of the water added is converted into hydrogen, 100 kg of raw waste generated 106.9 kg of cleaned gas with a calorific value of 1400 kcal/N cu m. After scrubbing, this gas contains 51% nitrogen, 20% hydrogen, 14% CO, 8%, CO₂, 3% oxygen, 3% methane, 1% other hydrocarbons, as well as 120 ppm of ammonia, 30 ppm hydrocyanic acid, 20 ppm SO₂, and 10 ppm H₂S. Both processes generate gases which represent hardly any environmental hazard, and the volume of these pyrolysis gases amounts to about 10% of that generated by conventional incineration. The low dust content makes electrostatic precipitators unnecessary. The pyrolysis gas incorporated about two thirds of the energy content of the waste, and 50% of this recovered energy is needed for the pyrolytic process.

59110

APTIC NO. 76553

Tadokoro, Asao

SECONDARY AIR CONTROLLING DEVICE OF REACTOR OF EXHAUST GAS PURIFYING SYSTEM. (Haiki gasu joka sochi no hannokiyo 2ji kuki seigyosochi). Text in Japanese. (Toyo Kogyo Co., Ltd. (Japan)) Japan. Model Util. Sho 50-20185. 3p., June 19, 1975. 2 refs. (Appl. July 9, 1970, 1 claim).

AIR POLLUTION ABSTRACTS, JUNE 1976

A secondary air control device for a recombustion exhaust gas purification system is designed to supply air only at low engine speed or at low load when the concentration of incompletely combusted components is increased. The air control device consists of a circuit actuated by a thermo-sensor and a vacuum switch mechanism actuated by the negative pressure in the intake pipe. The secondary air control valve controlled by the thermo-sensor is not actuated at low engine temperature when the engine is started, allowing the flow of air into the reactor. With an increase in engine temperature, the air control valve is actuated, shutting off the air flow. During idling or deceleration at high engine temperature, the vacuum switch mechanism is actuated when the negative pressure in the intake pipe exceeds 300 mm Hg (setting atmospheric pressure as zero), allowing the flow of secondary air into the reactor.

59111

APTIC NO. 82410

Tadokoro, Tomoo and Masayuki Kawata

EXHAUST GAS PURIFYING REACTOR. (Toyo Kogyo Co., Ltd. (Japan)) U. S. Pat. 3,898,802. 7p., Aug. 12, 1975. 4 refs. (Appl. July 2, 1973, 2 claims).

An exhaust gas purifying reactor is described for an internal combustion engine. It consists of an inner shell and an outer shell surrounding the inner shell with an adiabatic space formed between them. The inner and outer shells are rigidly connected by at least one of intake and exhaust passages, to support the inner shell within the outer shell. The other passage supports the inner shell to permit it to move sealingly and slidably in the axial and radially outward direction of the axis of the other of the intake and exhaust passages. In other reactors of this type the manufacture is relatively complicated, which hampers the productivity of the reactor. This disadvantage mainly results from the provision of the supporting member, and the manufacturing process requires an additional step for fitting the supporting member. This reactor overcomes this problem. (Author abstract modified)

59112

APTIC NO. 83111

Tager, S. A., A. M. Kalmaru, V. N. Panov, N. I. Noskova, V. I. Es kov, G. K. Krasnoselov, and A. P. Rybakov

FORMATION OF NITROGEN OXIDES AND SULFUR DIOXIDE DURING THE COMBUSTION OF FUEL OIL IN HEATING AND POWER PLANT BOILERS. (Obrazovanie okislov azota i sernogo anhidrida pri szhiganiy mazuta v kotlakh TETs). Text in Russian. Elektr. St. (Moscow), vol. 9:15-19, 1975. 5 refs.

Methods of decreasing the amount of nitrogen oxides polluting the atmosphere in industrial regions are discussed. Medium capacity metallurgical factories can emit from 50 to 100 tons of nitrogen oxides daily. Great quantities of emitted gases contain only small concentrations of nitrogen oxides. The reduction of nitrogen oxide formation by lowering the temperature in working areas is generally technologically impossible. Nonetheless, complex utilization of all means available—cleaning of gases, increasing the height of flues, and technological suppression of nitrogen oxide formation—should reduce the concentrations of this atmospheric pollutant.

59113

APTIC NO. 82121

Takacs, Edward Andrew

PROCESS FOR THE ODOR REMOVAL OF MALODOROUS SULFUR CONTAINING OLEFINIC DERIVATIVES. (American Cyanamid Co., Stamford, Conn.) U. S. Pat. 3,909,395. 3p., Sept. 30, 1975. 10 refs. (Appl. Sept. 23, 1974, 11 claims).

A process for the upgrading of a malodorous, sulfur contaminated, aliphatic, aromatic, or cycloaliphatic olefinic derivative or mixture is described. In a specific example, a suitable flask, immersed in a water bath and equipped with a stirrer and a thermometer is charged with 100 parts of a particularly foul smelling crude sulfate turpentine containing 4800

ppm of sulfur. Stirring is initiated and 7.0 parts of 40% aqueous peracetic acid are slowly added at a rate so as not to exceed a pot temperature of 25 C. Subsequent to the addition of all the peracid, the resulting mixture is stirred at ambient temperature for 1 hr, and is then washed with water to obtain an odor improved product containing 200 ppm S. It is steam distilled to yield 93 parts of a pleasant smelling distillate which contains 95 ppm S. A foul smelling, S contaminated gasoline can be substituted for the crude sulfate turpentine to yield a sweet smelling gasoline of substantially reduced S content.

59114

APTIC NO. 76417

Takacs, Pal

POSSIBILITIES OF THE HUNGARIAN COAL MINING INDUSTRY IN SULFUR AND SOOT EMISSION ABATEMENT. (A magyar szénbányászat adottsagai és lehetőségei a ken- és koromemisszió csökkentése területein). Text in Hungarian. *Energiagazdalkodás*, 16(7):323-328, July 1975. 14 refs.

Possibilities of the Hungarian coal mining industries concerning the abatement of sulfur dioxide and soot emissions from coal firings are presented. Most of the coal mined in Hungary is unfavorable environmentally due to its high sulfur content. The total sulfur contents range from 0.5 to 6.7%, and 50 to 90% of the total sulfur is emitted into the atmosphere. About 94-98% of the sulfur emitted is in the form of sulfur dioxide, and the balance is sulfur trioxide. The specific sulfur emission amounts to about 7.5 g/1000 kcal. Since the possibilities to intensify the extraction of low-sulfur coals are greatly limited, coal washing and treatment, such as pyrite removal, coking, and distillation are the most efficient methods for the reduction of the sulfur content in the coal. Increasing the content of basic substances in the ashes results in a reduction of the sulfur emission. Hungarian coals have low to medium tar content, which can be further decreased by coking or distillation. Coals with reduced smoke emission and low sulfur content should be reserved for domestic heating, and especially for special protected areas, which may result in a further increase in the SO₂ emissions from power plants, and consequently in the necessity of flue gas desulfurization, especially in large-capacity power plants where high stacks are no longer sufficient.

59115

APTIC NO. 72663

Takahashi, Takeo and Tadayoshi Kuto

ELECTROSTATIC PRECIPITATOR BY WET METHOD. (Shishiki denki shujinki). Text in Japanese. (Hikaru Kogyo Co., Ltd., Tokyo (Japan)) *Japan. Model Util. Sho* 50-2608. 3p., Jan. 23, 1975. (Appl. Dec. 29, 1970, 1 claim).

An electrostatic precipitator with side glass box was designed especially for preventing the infiltration of dust and water into the glass box which would result in electrical discharge on the glass surface by ionized wet dust. In the vertical precipitator with gas inlet located at the lower side and gas outlet at the upper side, the dust is collected between the discharge and collector electrodes, while the water flows down alongside the collector electrodes. The glass box with a center partition is attached to the upper side of the precipitator. Two openings are made, one on the upper side of the partition and the other on the lower side wall connecting the glass box and precipitator, through which a glass tube housing a high voltage power line connected to the discharge electrode is inserted into the precipitator. The two openings are covered with an air curtain to prevent the infiltration of dust and water into the glass box.

59116

APTIC NO. 81992

Takahashi, Yasuro, Yukihiisa Fujima, and Hisao Yamamoto

METHOD OF BURNING FUELS BY MEANS OF A BURNER. (Mitsubishi Jukogyo Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,907,488. 12p., Sept. 23, 1975. 3 refs. (Appl. Feb. 14, 1974, 9 claims).

A method of burning gaseous and liquid fuels in a premix flame is described which results in reduced nitrogen oxide

emissions as compared to those levels emitted from conventional diffused flame burners. The fuel is premixed with air in an amount larger than the quantity theoretically required for the combustion of the fuel, and the resulting lean premixture is issued from a number of nozzles on the burner. At the same time fuel is also mixed with air in an amount less than the theoretically required quantity, and the resulting rich premixture is issued from the remaining nozzles of the burner. The two gaseous premixtures are burnt together to produce a so-called premixed flame. (Author abstract modified)

59117

APTIC NO. 80349

Takamura, A., K. Inoue, and T. Sakai

RESOURCES RECOVERY BY PYROLYSIS OF WASTE TIRES. Kobe Steel, Ltd., Kobe (Japan), *Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland*, 1975, p. 532-537. 3 refs. (Nov. 3-5.)

A pyrolysis process developed to recover useful materials from waste tires is described. One ton of crushed tires produced 513 kg of oil, 152 kg of gas, and 335 kg of char at a furnace temperature of 850 C and at a feeding rate of 158 kg/hr. The oil produced can be used as fuel or process oil for rubber compounding. The char can be used to make carbon black or active carbon. The gas produced is used as a clean fuel after removing the hydrogen sulfide.

59118

APTIC NO. 83817

Takasaki, S.

ON THE WET TYPE STACK GAS DENITRIFICATION FACILITY. (Shishiki haen dassho sochi ni tsuite). Text in Japanese. *Sangyo to Kankyo (Ind. Environ.)*, vol. 1975:71-76, Nov. 1975.

The Fujinon S-N facility of the Fujikasui Industrial Co., Ltd. is described. Both desulfurization and denitrification of flue gases are possible in this facility, which uses the wet-type oxidation-reduction method. The nitric oxide is oxidized to nitrogen dioxide which is then reduced to nitrogen gas by sulfites such as sodium, calcium, or ammonium sulfite, produced by the absorption of sulfur dioxide by the appropriate alkali solutions. The oxidizing agent is chlorine dioxide or ozone. These reactions occur in a tower. Three of these facilities are presently being operated. A 99% desulfurization rate and a denitrification efficiency of more than 90% have been obtained. The soot and dust components in the flue gases can be also reduced by this facility. The typical composition of the treated flue gases is: nitrogen oxides less than 20 ppm, SO₂ less than 5 ppm, oxygen 4%, and dust 0.03 g/N cu m. No ClO₂, chlorine gas, or hydrochloric acid fume are present in the treated gas. The combustion gases of heavy oils containing low to high sulfur can be treated by the facility. The typical operating cost for the treatment is \$31 to \$33/l kl heavy oil containing up to 3% S.

59119

APTIC NO. 79684

Takashima, Akio

RECENT ASPECTS IN DEVELOPMENT OF NOX AIR POLLUTION CONTROL TECHNOLOGIES FOR STATIONARY SOURCES BY WET METHOD IN JAPAN. Text in Japanese. *Nenryo Kyokaiishi (J. Fuel Soc. Japan)* (Tokyo), 54(576):239-249, April 1975. 7 refs.

The development of nitrogen oxides air pollution control technologies by the wet method to meet the 0.02 ppm standard for stationary sources in Japan is discussed. The wet method involves either the direct removal of nitric oxide or NO_x, or combinations of gas phase oxidation of NO to higher oxides and liquid phase chemical reactions. More than 30 companies are studying liquid waste treatment and the simultaneous removal of sulfur oxides. The basic principles and efficiencies of NO_x removal are compared, major activities of development are introduced, and applications to air pollution control processes and plants are discussed.

59120

APTIC NO. 82147

Takayasu, Masami, Kyoichi Kanzaki, Yoshiaki An-nen, and Yoshiro Morita

EFFECTS OF O₂ AND SO₂ ON THE REDUCTION OF NO WITH NH₃. Text in Japanese. *Nenryo Kyokaishi (J. Fuel Soc. Japan (Tokyo))*, 54(8):684-689, 1975. 11 refs.

The effects of oxygen and sulfur dioxide on the reduction of nitric oxide with ammonia were investigated in detail in the presence of a copper or chromium-alumina catalyst. Promotive action of O₂ was observed between 200 and 300 C, but not at 400 C. Slight amounts of nitrogen dioxide were formed by the oxidation of NO or NH₃, but not when SO₂ was present. Sulfur dioxide poisoned the active center for NO reduction with NH₃ and reduced considerably the amount of adsorbed NO and NH₃ on the Cu-alumina catalyst. Sulfur dioxide also poisoned the active center of NO or NH₃ oxidation.

59121

APTIC NO. 83255

Takenouchi, Ryugoro

PRESENT STATUS OF THE USE OF BOILER WET-TYPE STACK GAS DESULFURIZATION FACILITIES.

(Boira shishiki haen datsuryu sochi riyō no jitsujō). Text in Japanese. *Boira Gishi (Boilermen)*, 30(10):865-873, Oct. 1975.

The performance of the Yoshimine GR40 model wet-type stack gas desulfurization device installed at a 30 t/hr boiler of the Iida Senko Co. in Osaka is discussed. The Yoshimine GR40 was chosen because it fulfills the following conditions: good and stable desulfurization efficiency; adjustability to the various boiler loads; simple operational procedures; inexpensive equipment and running costs; freedom from failure, corrosion, and secondary pollution; compact size; adaptability to a boiler and a smoke stack; and recyclability of plant waste water. A desulfurization efficiency of over 90% and a dust removal rate of over 80% were achieved with the boiler using class C heavy oil containing sulfur below 2.7%, which is the same as using fuel oil with a sulfur content of 0.27%. At present, environmental regulations require plants with a daily fuel consumption below 30 kl to use a fuel oil with a sulfur content below 0.5% if there is no desulfurization device. Therefore, the Iida Senko Co. recovered the cost of the desulfurization equipment in one year because there was no necessity to change to a more expensive higher-grade fuel oil for the boiler.

59122

APTIC NO. 83954

Takeuchi, Hiroshi, Katsuroku Takahashi, Makoto Ando, and Yasuo Yamanaka

NO_x ABSORPTION BY SODIUM SULFITE AQUEOUS SOLUTION. (*Aryusan soda suiyoeki ni yoru NO_x no kyushu*). Text in Japanese. Preprint, Society of Chemical Engineering, Tokyo (Japan), p. 483-484, 1975. 2 refs. (Presented at the Japanese Society of Chemical Engineering, Autumn Conference, 9th, Fukuoka, Oct. 17-20, 1975.)

Sample gas containing nitrogen dioxide, nitric oxide, and nitrogen was introduced through a glass tube 2 mm in inside diameter at a flow rate of 1 cm/sec to an agitated vessel 13.7 cm in inside diameter. Sodium sulfite solutions of various concentrations were supplied to the vessel at 100 cu cm/min while the temperature was kept at 25 C. The total volume of the absorbent in the vessel was maintained at 2 liter. The nitrogen oxides concentrations before and after absorption were determined by using a Yanagimoto ECL-7S chemiluminescence NO_x analyzer. Results showed that the reaction rate was proportional to the square of NO_x concentration and NO_x removal was very slow at low NO_x concentrations. Nitrogen dioxide reacted at a very fast rate at high Na₂SO₃ concentrations.

172

59123

APTIC NO. 83808

Takeuchi, Suetō

ON THE DEVELOPMENT OF STACK GAS DENITRATION TECHNOLOGY IN THE CHUBU ELECTRIC POWER CO. INC. (*Chubu denryoku ni okeru haen dasho gijutsu no kaihatsu ni tsuite*). Text in Japanese. *Nenryo Oyobi Nensho (Fuel and Combustion)*, 42(11):961-969, Nov. 1975.

Two new processes for flue gas denitration were developed. Both processes employ the dry-type ammonia reduction method. The first process uses a catalyst developed by Mitsui Toatsu chemicals and was tested at a 8000 N cu m/hr test plant. The waste gas from a boiler was passed through a pre-heater and an electrostatic precipitator. The resulting gas was mixed with ammonia and the mixed gas was introduced to a reactor packed with the catalyst. A denitration rate of more than 80% was achieved with no sign of catalyst deterioration after 3200 hr of operation. The second process used a catalyst developed at Takeda chemicals. The catalyst was based on activated carbon and was used for desulfurization as well as for denitration. Test results at a 100 N cu m/hr plant showed 50-70% denitration and more than 90% desulfurization with no sign of catalyst deterioration after 2900 hr of operation.

59124

APTIC NO. 82332

Tamai, Hisashi and Yoshitoku Iizuka

INTEGRAL INTAKE AND EXHAUST CONDUIT FOR INTERNAL COMBUSTION ENGINE. (*Honda Giken Kogyo Kabushiki Kaisha, Tokyo (Japan)*) U. S. Pat. 3,892,212. 5p., July 1, 1975. 11 refs. (Appl. June 22, 1973, 7 claims).

A novel intake and exhaust pipe configuration for an internal combustion engine is described which uses the heat in the exhaust passage to improve the vaporization of the fuel mixture. The auxiliary intake passage is integrally formed with the exhaust passage such that a corrugated partition separates the two passageways forming a common corrugated wall between. The corrugations in the wall impede the flow of intake mixture along the auxiliary intake passage, during which time the heat is transferred from the exhaust gas in the exhaust passage through the corrugated partition to the incoming mixture. This vastly improves the vaporization of the mixture and reduces the amount of unburned hydrocarbons emitted to the atmosphere.

59125

APTIC NO. 83494

Tanaka, Eiichi, Ryohei Nishimura, Hiroshi Nomura, Tsutomu Hoshino, Akira Yamada, and Hifumi Hiraoka

MANUFACTURING METHOD OF REFINED COKE OVEN GAS. (*Seisei kokusuro gasu no seizohō*). Text in Japanese. (*Mitsubishi kakoki Kaisha Ltd. and Mitsubishi Chemical Industries Ltd. (Japan)*) Japan. Pat. Sho 50-37041. 6p., Nov. 29, 1975. (Appl. Oct. 31, 1972, 1 claim).

A manufacturing method for refined coke oven gas (COG) with no sulfuric composition is described. The catalytic reduction of the gas takes place using an absorption solution such as liquid ammonia for removal of hydrogen sulfide contained in COG. The COG generated from the carbonization of coal contains tar, water, benzol, naphthalene, ammonia, hydrogen sulfide, carbon dioxide, and hydrogen cyanide which clog and corrode the supply pipes and are harmful to the human body. Therefore COG cannot be supplied to users without removing foreign matter. The new process effectively removes the acidic gas in the COG and recovers useful substances from it. This process consists of a coke oven, a primary cooler, a first stage absorption section where liquid ammonia removes acidic gas, a second stage absorption section where liquid ammonia removes the remaining hydrogen sulfide, and a deoxidation section. The resources recovered in this process are high quality sulfur, concentrated sulfuric acid, and fuming sulfuric acid.

CONTROL METHODS

59132

59126

APTIC NO. 76505

Tanaka, Isao

RAPPING DEVICE IN THE ELECTRIC DUST COLLECTOR. (*Denki shujinki ni okeru tsuchiuchi sochi*). Text in Japanese. (Aijigawa Iron Works and Construction Co., Ltd., Osaka (Japan)) Japan. Model Util. Sho 50-27977. 2p., Aug. 19, 1975. (Appl. Nov. 26, 1971, claims not given).

A device to hit a rocker arm that acts as a rapper in electrostatic dust collectors is described. A vertically moving arm is mechanically connected to a pivoted arm. As the former arm moves up, the latter arm moves to the inner side to push the pivoted rocker arm whose rapping point moves to the outer side. As the second arm moves further inside, it disengages from the rocker arm, thus allowing the rapper to hit the wall of the dust collector. No force is transmitted from the rocker arm to either the vertically moving arm or the second arm, since there is no permanent mechanical engagement between the second arm and the rocker arm.

59127

APTIC NO. 80343

Tanazawa, Yasushi, Kenta Inoue, Kenji Ishiguro, and Tokio Kohama

EMISSION GAS PURIFICATION DEVICE FOR INTERNAL COMBUSTION ENGINES. (*Nainenkikan haiki gasu jyoka sochi*). Text in Japanese. (Nippon Denso Co., Ltd., Toyota Chuo Kenkyusho, and Toyota Motor Co., Ltd. (Japan)) Japan. Pat. Sho 50-32688. 4p., Oct. 23, 1975. 2 refs. (Appl. Nov. 4, 1970, 1 claim).

The process described relates to an exhaust gas purifier for internal combustion engines which recombusts the remaining carbon monoxide and hydrocarbons in a reaction chamber attached to the exhaust pipe. The purifier consists of a cylindrical combustion chamber and a reaction chamber. Both chambers are connected by an opening where vortex combustion flames flow from the combustion chamber to the reaction chamber. The characteristic feature of this purifier is a fuel injector made of porous incombustible sintered metal alloy from the surface of which the fuel is gasified. Simultaneously the metal alloy serves as secondary electrode for the primary electrode of the igniter, which results in the emission of direct sparks between the main electrode and the sintered metal alloy when a direct high voltage electric current is introduced to the igniter. The gasified fuel immediately deflagrates and the cylindrical vortex flames blow into the reaction chamber where a mixture of excess air from the combustion chamber and the exhaust gas is ignited. Hence the carbon monoxide and hydrocarbons contained in the exhaust gas are completely burnt, and clean harmless gas is released.

59128

APTIC NO. 82287

Tanazawa, Yashushi, Kenta Inoue, Kenji Ishiguro, and Tokio Kohana

EMISSION GAS PURIFICATION DEVICE OF INTERNAL COMBUSTION ENGINES. (*Nainen kikan haiki gasu jyoka sochi*). Text in Japanese. (Nippon Denso Co., Ltd., Toyota Cuo Kenkyusho, and Toyota Motor Co., Ltd. (Japan)) Japan. Pat. Sho 50-32690. 6p., Oct. 23, 1975. 1 ref. (Appl. Nov. 4, 1970, 2 claims).

A spiral combustion type emission gas purification device for internal combustion engines in automobiles, which recombusts and purifies uncombusted carbon monoxide and hydrocarbons is described. Conventional spiral combustion type emission gas purification devices have the disadvantage of extinguishing combustion, especially during acceleration and gear shifting when uncombusted CO and HC increase in the exhaust gas. The new process includes a means to check the exhaust gas flow and the effects of exhaust pressure from the reaction chamber to the combustion chamber, in order to maintain combustion in the combustion chamber during all driving modes. The design characteristic of this preventive means is a cylindrical dividing wall between the combustion chamber and reaction chamber.

59129

APTIC NO. 82122

Tange, Shoji and Meroji Nakai

TORCH IGNITION RECIPROCATING-PISTON TYPE INTERNAL COMBUSTION ENGINE. (Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,908,618. 4p., Sept. 30, 1975. 5 refs. (Appl. Feb. 25, 1974, 1 claim).

A torch ignition reciprocating piston internal combustion engine is described which has an improved exhaust gas recirculation system. Nitrogen oxides are formed by combination of nitrogen and oxygen from the air in both the main combustion chamber and the antechamber of internal combustion engines. A conventional torch ignition reciprocating piston type engine cannot reduce considerably the concentration of NOx without increasing unburned constituents including hydrocarbons and carbon monoxide. During no-load engine operation (idling) and during low speed and light-load engine operation in this engine, valves close so that recirculation of exhaust gas into the main combustion chamber and the antechamber respectively is prevented, so that misfiring or extinguishing of the flame will not result. Since during these engine operating conditions the combustion temperature in both the main combustion chamber and the antechamber is low, formation of NOx is negligible. During medium engine load operation, the second valve is opened to recirculate exhaust gas into the antechamber to prevent an excessive temperature rise therein. Nitrogen oxide formation is reduced during this engine operating condition.

59130

APTIC NO. 79763

Tantram, A. D. S. and A. C. C. Tseung

ELECTROCHEMICAL TECHNOLOGY AT CITY UNIVERSITY. *Chem. Eng.*, no. 302:599-602, Oct. 1975. 11 refs.

Research studies on controlling exhaust emission and cyanide wastes conducted at City University (London, England) are described. Lanthanum-strontium-cobalt oxide catalysts were tested for use in catalytic converters for controlling exhaust emissions. The catalyst enables the necessary oxidation reactions of unburnt hydrocarbons and carbon monoxide to be carried out at considerably lower temperatures than most other catalysts. Pulse electrolysis is effective in eliminating problems in destruction of cyanide wastes due to formation of secondary oxygen evolution and intermediates that block the electrode surface and inhibit the reaction. The current is switched on for a short time and the cyanide ions at the electrode surface are electrochemically oxidized. When their local concentration is no longer high enough to sustain the current, the current is switched off, the inhibiting intermediates clear from the surface, and the local concentration becomes replenished by diffusion.

59131

APTIC NO. 82382

Tao, Ting C. and Robert W. Heiser

APPARATUS FOR FILTERING ENGINE EXHAUST. (Rockwell International Corp., Pittsburgh, Pa.) U. S. Pat. 3,898,064. 6p., Aug. 5, 1975. 12 refs. (Appl. May 9, 1974, 3 claims).

A filtering device for the removal of liquid droplets and solid particles from the exhaust of an internal combustion engine is described. The filter is designed to reduce impurity build-up on the filter material. Exhaust gases are directed within the filter container and are swirled around the interior circumference of the container so that centrifugal force causes a relatively large amount of the impurities to be trapped in a region out of the general flow path of the gases. The gases then flow through a fiberglass filter toward a central region of the container which communicates with an outlet fitting. (Author abstract modified)

59132

APTIC NO. 79351

Tate, Kazuhito, Masao Iguchi, Tamotsu Nagai, Yoshihito Satomi, Akira Sakurada, Harumi Kagaya, Kyohiko Inaba,

Saburo Ohnishi, Reijiro Nishiyama, and Takehiko Mizushima

MANUFACTURING METHOD OF SUPPORTER AND CATALYST FOR HYDROGENATION DESULFURIZATION CATALYST. (Suisoka datsuryu shokubaiyo tantai oyobi shokubai no seiho). Text in Japanese. (Researching and Developing Assoc. of Heavy Oil Direct Desulfurization (Japan)) Japan. Pat. Sho 50-18475. 2p., June 28, 1975. 1 ref. (Appl. May 29, 1970, 2 claims).

This invention relates to the manufacturing of the catalysts and supporters for the hydrosulfurization of residue oil containing a considerable amount of catalyst-poisoning substances. Alumina gels prepared from aluminum triisopropiolate and aluminum tributoxylate were fired at 550 C for 2 hr. The resulting aluminas were degased at 300 C for another 2 hr. The alumina powders thus prepared showed strong acidity. Magnesium hydroxide or calcium hydroxide (5%) and distilled water (30-40%) were added to the alumina. The mixture was kneaded for 2 hr and was molded into pellets 1.5 mm by 10 mm in size. The pellets were fired at 550-660 C for 2 hr to obtain the supporters. The supporters were immersed in ammonium molybdate and nickel sulfate or cobalt nitrate solution for overnight to obtain a catalyst which contained 15% molybdenum trioxide and 5% nickel oxide or 5% calcium oxide. The catalyst was dried at 120 C for 2 hour and was then fired at 350 C for 2 hr and at 550-600 C for 2 hour. The catalyst showed more than 85% desulfurization rate.

59133

APTIC NO. 82952

Tateno, Hideki and Kyuji Arai

AIR VENT CHANGING TYPE OF CARBURETOR. (Eabento kirikaeshiki kikaki). Text in Japanese. (Toyota Motor Co., Ltd. (Japan)) Japan. Model Util. Sho 50-37468. 3p., Oct. 31, 1975. (Appl. Feb. 25, 1971, claims not given).

An auto carburetor with a dual selective air vent for fuel vapor control in the float chamber, which can vent the float chamber to vacuum air or to atmospheric air according to the operational mode of the engine. In conventional carburetors, gasoline in the float chamber vaporizes from overheating after the engine is stopped. The vapor seeps through the air vent to the fuel/air mixture passage and over-concentrates the mixture. This results in difficulty in restarting the engine, and increases emission of carbon monoxide during idling. The new process is an improvement over these conventional difficulties, and provides an inner vent which connects to the fuel/air mixture passage in the carburetor and an outer vent which connects to atmospheric air or the vapor fuel control system outside of the carburetor. The other end of these inner and outer vents connects to the float chamber. When the engine is stopped or is idling, the inner vent is closed while the outer vent is open to provide the float chamber with atmospheric air. During other operational modes, the float chamber vents to a vacuum.

59134

APTIC NO. 82858

Taylor, John C.

ADSORBING APPARATUS. (Assignee not given.) U. S. Pat. 3,876,397. 5p., April 8, 1975. 5 refs. (Appl. Jan. 2, 1973, 4 claims).

A self-stripping, recycling adsorbing unit for recovery of hydrocarbons from a mixture of hydrocarbon vapors and air is described. Anti-pollution legislation requires the prevention of hydrocarbon emissions from automobile fuel tanks and service station tanks during fueling operations. Prior methods are undesirable because of high cost and poor performance. This apparatus includes two adsorbers filled with activated carbon, automatically controlled valves which route the mixed vapor flow through one adsorber and connect the other to a stripping apparatus, and instrumentation which automatically determines when the flows through the adsorbers should be interchanged and which activates the automatic valves to accomplish this interchange. The apparatus provides a continuous adsorbing apparatus with automatic regeneration. (Author abstract modified)

174

59135

APTIC NO. 76585

Tek, M. R.

SYNTHETIC GAS AND LIQUID FUELS FROM COAL. *Energy Commun.*, 1(5):495-523, 1975. 7 refs.

Processes for the production of synthetic gases and liquid fuels from coal are discussed. If the coal has unacceptably high organic sulfur, the cleaning route may involve gasification, liquefaction, or solvent refining, with the final, clean product being high or low-Btu gas, liquid fuels, or prilled congealed solids. The concept of fluidized bed combustion utilizes limestone or dolomite beds for sulfur removal within the combustion chamber. Conversion involves gasification, liquefaction-dissolution-solvent refining, or pyrolysis. Pyrolysis is chemical decomposition of coal due to heat, yielding a liquid product and a solid residue fuel such as coke or char. The various gaseous and liquid products formed include: hydrogen, carbon monoxide and dioxide, nitrogen, methane, ammonia, hydrogen sulfide, benzene, phenol, and naphthalene anthracene. The solid residue fuel is char: primarily carbon, ash, and sulfur. The overall economic comparisons between solid liquid and gaseous fuel from coal are tabulated.

59136

APTIC NO. 83167

Teller, Aaron J.

TEST PROCESS AND APPARATUS FOR TREATMENT OF JET ENGINE EXHAUST. (Teller Environmental Systems, Inc., Worcester, Mass.) U. S. Pat. 3,899,923. 7p., Aug. 19, 1975. 5 refs. (Appl. May 13, 1971, 35 claims).

A process and apparatus for treating the exhausts of jet engines being tested on jet test stands are described. In typical testing operations the amount of augmentation air induced by the exhaust flow ranges from two to four times that of the jet exhaust for turbojets with afterburners and from one half to two times the mass of the jet exhaust for fan jets. The combined stream of cooled jet engine exhaust and augmentation air is passed to equipment such as scrubbers and precipitators. The solid particles in exhaust flow are removed and the noxious gases are absorbed. In this system, a jet or spray of water is introduced to the surface of the exhaust stream serving at once to augment the exhaust and cool it. Substantially less augmentation air is required to absorb the energy of the exhaust. The load on downstream pollution abatement equipment is lessened and the treated exhaust is at least partially condensable. (Author abstract modified)

59137

APTIC NO. 76423

Terada, H.

NOX EMISSIONS CONTROL FOR COMBUSTION EQUIPMENT AND ITS EFFECT. (Nensho ni okeru NOx no seisei yokusei hoho to sono koka). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(11):1256-1265, Nov. 1975. 6 refs.

Based on the basic concept of formation mechanism of nitrogen oxides, various emission control methods for NOx were experimentally investigated and evaluated. Effects of cooling (controlled combustion chamber temperature), air-fuel ratio, and fuel characteristics (content of nitrogen compounds) on NOx emission are described with experimental data. Control methods based on operating conditions including air ratio, air resistance, combustion load, and air temperature and combustion methods including low NOx burner, exhaust gas recirculation, and two-stage combustion are also discussed with experimental data on NOx emission reduction efficiency.

59138

APTIC NO. 82395

Teramoto, Masaaki, Masato Ikeda, Tsutomu Kitagawa, and Hiroshi Teranishi

REACTION ABSORPTION MECHANISM OF DILUTE NITROGEN MONOXIDE TOWARD AQUEOUS KMNO4 SOLUTION. (KMNO4 suiyoeki chu e no kihaku NO no hanna kyushu kiko). Text in Japanese. Preprint, Japan Society Chemical Engineers, Tokyo, p. 487-488, 1975. 3

refs. (Presented at the Japan Society of Chemical Engineers, Autumn Meeting, 9th, Fukuoka, Oct. 17-20, 1975, Paper F310.)

The absorption mechanism from 15-50 C of nitric oxide (50-5630 ppm in gas supply) in an aqueous solution of potassium permanganate (KMnO_4 0.0316-0.316 mol/l) in sodium hydroxide (NaOH 0-1 mol/l) was investigated. The gas flow rate was 100 or 200 cc/min. At the concentrations under study, NO reacts with permanganate and hydroxide ions to form nitrite and manganate ions and water. At 25 C, the absorption coefficient of NO reached more or less constant values, after certain stirring speeds were attained, for both gaseous stirring (1500 rpm), and liquid stirring (450 rpm). Also, the rate of NO absorption increased linearly with increasing NO gas-liquid interface concentration, and with increasing KMnO_4 concentrations. As NaOH concentration increased, the reaction rate constant increased, but the absorption coefficient decreased. The apparent activation energy for the reaction was 3.1 kcal/mol. From bubble tower experiments, this absorption mechanism was shown to be applicable to NO in stack gases, in industrial absorption equipment.

59139

APTIC NO. 82511

Terebenin, A. N., A. P. Bykov and V. Y. Sherstov

DEDUSTING GASES AT HIGH TEMPERATURES.

(*Obespylivanie gazov pri vysokikh temperaturakh*). Text in Russian. *Tsvetn. Metal.*, no. 9:54-55, Sept. 1975.

Increasing the waste gas temperature from 215-235 C to 266-288 C in an electrostatic precipitator used to separate dust behind a fuming furnace for tin-containing materials resulted in a reduction of the water consumption for gas cooling from 178-221 g/cu m to 150-165 g/cu m, and in an increased dust separation efficiency. At the same time, the electric resistance of sublimed metals decreased, which resulted in a considerable reduction in the arsenic emission. The reduced corrosion hazards led to a prolonged service life of the precipitator.

59140

APTIC NO. 83968

Teverovskiy, B. Z., V. I. Sergeev, and O. N. Sidorenko

ON ANALYSIS OF INERTIAL DUST SEPARATORS FOR DRY DUST REMOVAL FROM BLAST-FURNACE GAS.

(*K raschetu inertsionnykh pyleotdeliteley dlia sukhoy ochistki ot pyli domennogo gaza*). Text in Russian. *Izv. Vysshikh Uchebn. Zavedenii Energ.* (Minsk), no. 6:85-90, 1975. 6 refs.

The use of inertial dust separators for dry dust removal increases the technical and economical efficiency of blast furnaces. A mathematical description of the dust-removing process in inertial separators is given and results of experiments based on a computerized model are described. There was an essential increase of the efficiency of dust removal in separators when the size, velocity, and density of dust increased. This relationship is given for cases when the radius of the separator and the velocity of the particles were, respectively: R equals 0.25m, V equals 25m/sec; R equals 0.25m, V equals 50m/sec; R equals 0.5m, V equals 25m/sec; R equals 0.5m, V equals 50m/sec. The density of dust varied from 1000 to 6000 kg/cu m and the sizes of particles varied from 20 to 100 micron. The results of experimental studies confirm the theoretical analysis, which is useful for evaluating inertial dust separators.

59141

APTIC NO. 83785

Theobald, Heinz

TECHNICAL TESTING OF A NEW PROCESS OF CATALYTIC NITROSE DESTRUCTION IN THE OFF GASES FROM NITRIC ACID PLANTS. (*Technische Erprobung eines neuen Verfahrens der katalytischen Nitrosezerstörung in Abgasen von Salpetersäureanlagen*). Text in German. *Chem.-Ing.-Tech.*, 47(24):1021-1022, 1975.

A catalytic method for the removal of nitrogen oxides from waste gases discharged from high- and medium-pressure absorption units of nitric acid plants is described on the basis of practical trials at BASF. The waste gases, containing 500-1000 ppm nitrogen oxides, have a temperature of 280 C. Combined with ammonia, and passing through a layer of vanadium pentoxide catalyst, the nitrogen oxides are reduced by ammonia to nitrogen and water. The residual nitrogen oxides and ammonia concentrations in the purified waste gas are 50-150 ppm, and 10-20 ppm, i.e., definitely below the visibility limit of the gas plume. The pressure loss amounts to about 1.5-2 m water column. Deposits of ammonium salts in the expansion turbine and pipelines were not observed. The bulk speeds range from 15,000-70,000 cu m/hr/cu m of catalyst for practical purposes.

59142

APTIC NO. 83194

Thompson, Stanley P., Walter T. Thompson, David L. Boyert, and Thomas R. Swearingen

METHOD AND APPARATUS FOR SEPARATING PARTICULATE MATTER FROM A GAS STREAM.

(*Thompson Dehydrating Co., Topeka, Kans.*) U. S. Pat. 3,883,327. 8p., May 13, 1975. 7 refs. (Appl. May 21, 1973, 17 claims).

A method and apparatus for separating particulate matter from a gas stream are described. The apparatus is effective in removing solid particles of even a very minute size from a gas stream by effectively building up the particle size until the particle can be removed by mechanical separation. The device is applicable to physically bringing together two substances in solution for purposes other than separation of particulate matter from a gas stream. Evaporation and recondensation are achieved without interrupting the flow of the fluid stream by gradually increasing the pressure differential between the liquid and the fluid stream through gradually increasing the cross sectional area of the stream until vaporization occurs. Recondensation of the liquid is achieved without interrupting the flow of the fluid stream by decreasing the internal pressure of the stream through gradually decreasing the cross sectional area of the fluid stream.

59143

APTIC NO. 82328

Thornburgh, William F.

METHOD OF MANUFACTURING AN INTAKE MANIFOLD FOR EXHAUST GAS RECIRCULATION.

(*General Motors Corp., Detroit, Mich.*) U. S. Pat. 3,892,026. 9p., July 1, 1975. 9 refs. (Appl. Oct. 13, 1972, 5 claims).

A method of manufacturing an intake manifold for exhaust gas recirculation is described. The exhaust gas recirculation passage is cast integrally in the intake manifold structure, extending from the exhaust crossover passage to a recirculation control valve and then to the induction passages. The opening from the recirculation passage to the induction passage is formed by a machining tool extending parallel to the induction passage wall. (Author abstract modified)

59144

APTIC NO. 82558

Thurston, Kelly W. and John H. Lundy

SPLIT CYLINDER ENGINE AND METHOD OF OPERATION.

(*General Motors Corp., Detroit, Mich.*) U. S. Pat. 3,880,126. 8p., April 29, 1975. 15 refs. (Appl. May 10, 1973, 10 claims).

A two-stroke split cylinder engine arranged for low exhaust emissions of hydrocarbons and nitrogen oxides was developed. Low emissions are obtained by providing interconnected pairs of cylinders with the pistons operating out of phase; the piston of one cylinder, called the induction cylinder, preferably moving somewhat less than one-half stroke in advance of the piston of the second cylinder, called the power cylinder. The induction cylinder is arranged to receive and compress a charge, which is subsequently transferred to the power cylinder, where it is mixed with a retained residual charge of

burned products from the previous cycle. The combined charge is further compressed, ignited by a spark plug, burned, and expanded to produce power. By providing a substantial dilution of the combustion charge with as much as 50% or more of burned gases, combustion temperatures are limited, reducing the formation of oxides of nitrogen in the burning process.

59145

APTIC NO. 82912

Tiggebeck, Donald David

FUEL VAPOR RECOVERY SYSTEM. (Calgon Corp., Pittsburgh, Pa.) U. S. Pat. 3,874,427. 5p., April 1, 1975. 1 ref. (Appl. March 20, 1974, 8 claims).

A fuel vapor recovery system is described for recovering vapors displaced from automotive vehicle fuel tanks during filling from a bulk storage tank. Displaced vapors are attracted by a vacuum in a dual system alternatively to a hydrocarbon vapor adsorbing means and to the bulk fuel storage tank. Unlike other vapor recovery systems, this system is designed to pull vapors through the adsorbent and/or to the underground bulk storage tank. It is designed to be active before fuel is pumped without relation to the amount or rate of pumping/fill. This system minimizes the hydrocarbon load on the adsorbent canister, which permits more effective and efficient operation. (Author abstract modified)

59146

APTIC NO. 72795

Tillman, R. M., O. L. Spilman, and J. M. Beach

POTENTIAL FOR METHANOL AS AN AUTOMOTIVE FUEL. Preprint, Society of Automotive Engineers, Warrendale, Pa., 25p., 1975. 6 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975.)

Dynamometer tests with a 1973 Ford 302 cu in. V-8 engine modified to run on methanol were performed to evaluate the fuel's potential in terms of its effect on vehicle performance and its impact on exhaust emissions. Nitrogen oxide emissions from the test vehicle were 3.3-4.8 times lower than those from an equivalent vehicle run on gasoline, and carbon monoxide emissions were from 22.8-54.4 times lower at maximum power. Unburned hydrocarbon emissions for the methanol fueled vehicle were from 0.3-0.5 times those measured from a gasoline powered equivalent, depending on the method of calculation. The hydrocarbon data were corrected for flame ionization detector response and did not include formaldehyde emissions. Lean methanol operation reduced maximum power output somewhat, although modification of gasoline operation to produce equivalent NOx emissions resulted in a greater power drop than with methanol operation. Methanol operation also showed high Btu efficiency. Although numerous problems are expected to occur in retrofitting automobiles with methanol, the task does not appear insurmountable. (Author conclusions modified)

59147

APTIC NO. 82664

Tinker, Walter H.

STEAM ENGINE SYSTEM AND PROCESS OF OPERATING THE SAME. (Assignee not given.) U. S. Pat. 3,877,231. 10p., April 15, 1975. 2 refs. (Appl. July 5, 1974, 16 claims).

The development and operation of a closed cycle steam engine system are described. The steam engine system has an increase in thermal efficiency over conventional types of Rankine cycle engines. This increase is achieved by heating the condensate from the condenser by a regenerative process during the compression stroke of the piston and delivering the heated condensate to the boiler by a boiler feed pump. (Author summary modified)

AIR POLLUTION ABSTRACTS, JUNE 1976

59148

APTIC NO. 79609

Toda, Tadahide, Yoshihiko Imamura, Yujiro Akiyama, Hisashi Oki, and Sumio Ito

SURVEY OF THE EFFECTIVENESS OF VEHICLE POWER CHARACTERISTICS ON NOX EMISSION AND FUEL CONSUMPTION. (Sharyo doryoku tokusei no NOx, nenryoshohi eno eikyo chosa). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, Tokyo, p. 573-582, 1975. 4 refs. (Presented at the Society of Automotive Engineers of Japan, Inc., Lecture Meeting, Kyoto, Oct. 29-30, 1975.)

The effects of the drive system of a vehicle on exhaust emission, fuel consumption, and running conditions were examined. The standard LA 4-mode method (USA) was employed. Reduction of the torque loss for an automatic transmission by 0.1 kg-m from a regular 0.6 kg-m resulted in a 2.4% reduction of nitrogen oxides emissions and 0.6% reduction of fuel consumption. Increase of converter capacity by 48% resulted in 2% NOx reduction and 2% fuel consumption reduction. No noticeable difference was observed between the no. 90 and no. 140 lubricants on their effects on NOx emission and fuel consumption at temperatures above 80 C. Radial tires, which show low rolling resistance, gave only 0.5% NOx reduction and 0.2% fuel reduction as compared to normal tires. The addition of an over-top gear having a reduction gear ratio of 0.8 to the auxiliary transmission of an automatic transmission could result in 7% NOx reduction and 4% fuel reduction.

59149

APTIC NO. 80129

Toda, Yoshio

AUTOMOBILE GASOLINE ENGINE. (Jidoshayo Gasorin Kikan). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 14(2): 19-22, Feb. 1975.

Air pollution control problems and the energy crisis have brought about differences between automobile gasoline engines in the United States and in Japan. In the United States most automobile makers devoted their efforts to the construction of more economical automobiles, due to the energy crisis. They adapted the catalytic converters and exhaust recycling systems to deal with pollution. On the other hand, in Japan, more severe automobile air pollution control standards were applied after 1975, and automobile makers have been engaged in the development of new engines. The REAPS and CEPA engine of Mazda, MCA II system of Mitsubishi, and CVCC engine of Honda are all typical results. These clean engines perform at the cost of slightly lower gas mileage.

59150

APTIC NO. 80342

Togami, Tadaomi

SMOKELESS COMBUSTION FURNACE. (Muen nenshoro). Text in Japanese. (Kohjin Co., Ltd. (Japan)) Japan. Pat. Sho 50-31388. 3p., Oct. 9, 1975. 2 refs. (Appl. June 5, 1971, 1 claim).

The process described relates to a smokeless furnace for incineration of plastic and rubber wastes which will not exhaust black smoke and has a long service life. The design features which accomplish the specific purpose of this process are a vertical cylindrical furnace, long and short air tubes erected adjacent to and along the inner cylindrical wall of the furnace, numerous air outlet holes provided on the air supply tubes to supply combustion air in the furnace, double wall construction with a water jacket provided to protect the furnace and smoke duct, and a doughnut air chamber at the bottom of the furnace between a castable center and the furnace wall. The number of the tubes, the size of the inner diameter of the tubes, the number of air holes, and the velocity of the air flow can be adjusted to maintain temperatures below the maximum thermal capacity of the specific air supply tube material. In this furnace the combustion gas will be effectively mixed with the air, and plastic and rubber wastes will be completely burned.

CONTROL METHODS

59151

Tohata, H.

CONTROL AND COUNTERMEASURES ON NITROGEN OXIDES. (Chisso sankabutsu no kisei to taisaku). Text in Japanese. Tekkoku (Iron and Steel Ind.), 25(6):48-55, June 1975. 19 refs.

Although Japan has somewhat lenient standards for carbon monoxide, the Japanese standard for nitrogen dioxide is about 1/5 of that of U. S. It has been pointed out that the Japanese standard has been based on very scanty medical data. It will be necessary to reexamine NOx standards and develop abatement technology. Unlike SOx control, fuel switching is not so effective for NOx control; rather, the combustion method itself must be examined. Various low-NOx combustion methods have been devised. However, it is necessary to develop technology to control increased emission of hydrocarbons, carbon monoxide, and lowered energy efficiency, increased draft pressure, and bigger furnaces, which accompany low-NOx combustion. Use of a catalyst does not guarantee simultaneous control of SOx and NOx from stack smoke. Wet denitrification of stack smoke has not arrived at a practical stage yet, although from an energy and conservation of resources point of view, wet processes must be developed. In the U. S., development of denitrification of stack smoke has been stopped, due to the high cost and low efficiency of methods devised so far.

59152

Tolksdorf, Hans-Joachim

THE INFLUENCE OF VALVE STEM SEALS ON HARMFUL PRODUCTS OF EXHAUST GASES. (Einfluss der Ventilschaft-Abdichtungen auf die Schadstoffe im Abgas). Text in German. Motortech. Z. (Stuttgart), 36(12):326-329, 1975. 4 refs.

Experiments on a four cylinder engine, using a European test cycle, indicate sharply reduced oil consumption when valve stem seals are used. Use of the seals also alters the carbon monoxide, nitrogen oxide and hydrocarbon concentrations in the exhaust gases, the change depending on the engine test cycle. For example, in the European test cycle, CO drops 15%, and NOx 7%, while hexane and propane hydrocarbons increase 14% and 2%, respectively, when using the seals. In some other operating conditions, there is a drop in exhaust gas hydrocarbon concentrations when using seals. Use of seals also reduces carbon deposits on the valves as well as the blue smoke in exhaust.

59153

Tomita, Tsutomu

EXHAUST GAS RECIRCULATION. (Toyota Jidosha Kogyo Kabushiki Kaisha, Toyota (Japan)) U. S. Pat. 3,888,222. 7p., June 10, 1975. 9 refs. (Appl. Aug. 20, 1974, 3 claims).

A system for optimizing recirculation of exhaust gases in the exhaust system of an internal combustion engine is described. A flow control valve is inserted in a passage interconnecting an intake system and exhaust system of the engine. The flow control valve is actuated in response to vacuum pressure upstream of a throttle valve to increase the flow rate of exhaust gases to be recirculated. The flow control valve is actuated to decrease the flow rate of recirculated gases in response to vacuum pressure downstream of the throttle valve. Unlike other systems, this system provides optimal volume of recirculated exhaust gases which is responsive to the volume of intake air, whereby exhaust gas recirculation is responsive to engine operating conditions. (Author abstract modified)

59154

Toorn, Lambertus J. van der and Heinz Voetter

RESIDUAL OIL HYDRODESULFURIZATION APPARATUS. (Shell Oil Co., New York) U. S. Pat. 3,880,598. 8p., April 29, 1975. 5 refs. (Appl. Dec. 22, 1972, 4 claims).

APTIC NO. 84700

An apparatus for hydrodesulfurizing residual hydrocarbon oils in a substantially liquid phase continuous process is described. The catalyst is periodically introduced at the top of the reactor and the spent catalyst is periodically withdrawn from the bottom. The apparatus consists of at least one high pressure reaction vessel containing a catalyst bed and having an inlet for introducing residual oil and hydrogen, and an outlet for withdrawing reaction products. It is connected by conduits and valves to a high pressure vessel from which fresh catalyst is introduced to the top of the catalyst bed and to a high pressure vessel into which spent catalyst is discharged from the bottom of the catalyst bed. The advantages over prior art systems included a uniform quality and an improvement of the on-stream time because it is not necessary for the unit to be shut down for catalyst replacement. (Author abstract modified)

59155

Toro, Richard F. and Norman J. Weinstein

CONTROLS FOR BURNING SOLID WASTES. Environ. Sci. Technol., 9(5):428-432, May 1975. 6 refs.

Instruments and alarms for thermal processing systems for solid wastes are described. Instrumentation is needed to control and monitor the basic incineration or pyrolysis process; to control and monitor associated subsystems such as steam generation, power generation, and resource recovery; to control and monitor environmental subsystems such as fly ash collection, waste water treatment and visible plume control; to protect equipment against corrosion, heat destruction, mechanical destruction, and operator abuse; and to collect data for calculating disposal costs and charges, making improvement, and designing additional facilities. The degree of automatic versus manual control depends not only on technical considerations, but on capital and operating budgets. Monitoring instruments measure, indicate, transmit, and record important process conditions including flow, temperature, pressure, weight, position, time, speed, voltage, and composition. Controls change these conditions, either manually or automatically, in response to a signal from a measuring instrument.

APTIC NO. 76272

59156

Toropkina, G. N., A. V. Kiyashko, V. P. Balabanov, O. P. Khanyukina, and G. M. Sizova

CATALYTIC DESTRUCTION OF THE DECOMPOSITION PRODUCTS OF PHENOL FORMALDEHYDE AND FURANE RESINS. (Kataliticheskiy metod obezvrezhivaniya produktov razlozheniya fenolformaldegidnykh i furanovykh smol). Text in Russian. Plast. Massy, no. 5:30-31, 1975. 2 refs.

A catalytic method for the oxidation of ammonia, phenol, formaldehyde, and methanol, generated by the thermal destruction of phenol formaldehyde and furane resins in pattern- and core-making operations, is described. At a bulk speed of 10,000/hr, the aluminum-platinum catalyst type AP-56 was found best for the catalytic oxidation of ammonia, phenol, and formaldehyde at 240 C with a negligible amount of nitrogen oxides generated as a reaction product. The catalytic oxidation of methanol on this catalyst requires a temperature of 400 C. The optimal conditions of the catalytic waste gas cleaning were determined to be a bulk speed of 10,000/hr and a temperature range of 220-240 C.

APTIC NO. 79599

59157

Toussaint, M. and S. Michelfelder

REDUCTION OF POLLUTANTS BY UTILIZATION OF HEAVY FUEL-WATER EMULSION FLAMES AND ITS EFFECTS ON THE ENERGY OUTPUT. Preprint, 9p., 1975.

The fuel-water emulsion was studied as a means of reducing pollution from the combustion of heavy fuel. The formation of nitrogen particles and nitrogen oxides was studied in flames with steam atomizing and flames with pressure atomizing. The concentration of particles was measured with a beta radiation

APTIC NO. 81085

attenuation apparatus. Nitric oxide measurements were performed with a chemiluminescence analyzer. The output and flux of heat transmitted to the hearth in flames with and without the fuel-water emulsion were compared. The emulsion flames considerably reduced the mass of particles formed in all cases. Water had essentially no effect on NO at a constant excess of air. The local increase in temperature in a zone close to the injector in pressure atomizing flames may increase the amount of nitrogen oxides produced. There was a 1% decrease in output due mainly to the heat absorbed by the evaporation of water. The emulsion flame should allow a reduction of the excess air, leading to an important reduction in nitrogen oxides. (Author abstract modified)

59158

APTIC NO. 83127

Townley, Harry

KILNS AND FURNACES. (Imperial Chemical Industries Ltd., London (England)) U. S. Pat. 3,887,326. 9p., June 3, 1975. 14 refs. (Appl. Sept. 21, 1973, 26 claims).

A method of operating kilns and furnaces in which granular material is heat treated is described. The heat distribution in the shaft is controlled by varying the pattern of the flow of gases in the shaft in accordance with a predetermined sequence while the general direction of flow of the gases remains unchanged. The variation in the pattern of gas flow is carried out while the general direction of flow in the shaft remains substantially constant. There may be changes in the general direction of flow and the varied patterns of flow may be imposed on a general flow in either or both directions. This method obtains even or controlled distribution of heating effect upon the material being processed on the shaft and assists in solving the problems which have arisen from uneven or uncontrolled heating effect in the prior art. (Author abstract modified)

59159

APTIC NO. 83120

Toyama, James

STEAM DUST SCRUBBER ATTACHMENT FOR EXHAUST STACK. (Assignee not given.) U. S. Pat. 3,888,642. 4p., June 10, 1975. 5 refs. (Appl. Nov. 28, 1972, 1 claim).

An anti-pollution exhaust gas scrubbing system for attachment to an exhaust stack is described. A horizontal extension from the vertical stack has a pair of spaced off-set filter baffles to produce a tortuous flow of the exhaust gases. A steam jet is provided for mingling steam with the exhaust gases upstream from the baffle. A drain system is provided beneath the horizontal portion of the pipe for draining off condensed steam water droplets containing solid particles entrained therein removed from the exhaust gases. (Author abstract modified)

59160

APTIC NO. 82082

Toyoda, Eiji, Masaaki Noguchi, Yukiyasu Tanaka, Bunda Tsuchio, and Masaharu Sumiyoshi

INTERNAL COMBUSTION ENGINE. (Toyota Jidosha Kogyo Kabushiki, Kaisha (Japan)) U. S. Pat. 3,908,606. 12p., Sept. 30, 1975. 12 refs. (Appl. Jan. 4, 1974, 42 claims).

An internal combustion engine which reduces the emission of harmful elements in exhaust gas is described. Conventional engines are not constructed so that the fuel used can be improved before being supplied to the cylinders. This engine is constructed so that a part of the hydrocarbon fuel is treated in the presence of oxygen to obtain a mixture of decomposition and oxidation products, including various reaction products. This mixture is applied to the cylinders. The oxidation reaction proceeds substantially perfectly and carbon dioxide and water are the primary products.

178

AIR POLLUTION ABSTRACTS, JUNE 1976

59161

APTIC NO. 84133

Treinies, Normann

HAS THE ENERGY SATELLITE A CHANCE? (*Hat der Energiesatellit eine Chance?*) Text in German. Umschau Wiss. Tech., 75(21):661-664, 1975. 6 refs.

In the light of the impending exhaustion of fossil power supplies, and the obstacles in the road to a prompt development of nuclear energy, a plan to put up an energy satellite to provide electric power from solar energy without pollution was studied. An American design (Peter Glaser) for a 5000 megawatt satellite-solar power station at a weight of 10,000 t was worked out. It would be powered into a 185 km orbit with a huge rocket at a fuel cost of \$3.3/kg of payload. The price for the satellite is estimated at \$900/kw or \$7.3 billion for the model station and ground installations. Based on today a technology, Central Europe, because of its low solar radiation was eliminated as a location for large terrestrial solar-electric converters. The energy supply via satellite would be as ecological beneficial as hydroelectric energy and would prevent any political pressures because energy would be supplied close to Central European consumer centers without the use of foreign territory. Construction and operation of the satellite would not lead to difficulties in the international balance of payment and could be the basis of a large industry. Further studies of economic feasibility should have clear priority. The complete satellite system would consist of solar cell collectors, microwave ray coherent transmission, and a ground station and its antenna.

59162

APTIC NO. 76395

Trubitsyn, L. A., S. A. Tager, and L. I. Kropp

PREVENTION OF AIR POLLUTION DUE TO COMBUSTION PRODUCTS IN THERMAL POWER PLANTS. (*Zashchita vozdušnogo basseyna ot zagryazneniya produktami szhiganiya topliva na teplovyykh elektrostantsiyakh*). Text in Russian. Teploenerg., no. 9:91-92, 1975.

Current problems and trends in clean air maintenance in the power plants of the USSR are discussed in connection with the Dec. 1974 Conference on Prevention of Air Pollution due to Combustion Products in Thermal Power Plants, organized by the USSR Ministry of Energetics and Electrification. The construction of large-capacity power plant units with high steam parameters, i.e., high efficiency, and with high stacks, is the basic trend in energetics in the USSR. The air pollution problems are greatest in the European territory of the USSR due to the inherently high background concentrations. Improved electrostatic precipitators and venturi scrubbers are being designed for more efficient fly ash separation, and existing installations are being modernized. The abatement of nitrogen oxides and sulfur dioxide emissions is the principal task for the near future. Sulfur dioxide emissions can be abated by the gasification of fuel oil and by the desulfurization of shale.

59163

APTIC NO. 76235

Truman, A. J.

CONSERVATION (AND MONEY IN YOUR POCKET) BY SOLVENT RECOVERY. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975. p. 560-573. (Feb. 17-21.)*

The operation and application of solvent vapor recovery systems are reviewed. Vapors can be recovered by adsorption onto the surface of active granular char. The char is packed within one or more steel vessels, and the solvent laden air is percolated through these beds. The capacity of the char may be between 10 and 100% (expressed as weight percent of solvent on char), depending on the solvent involved, the carbon used, the temperature, the influent solvent/air concentration, the desired effluent concentration, and the contact time. Once the char is fully loaded with solvent, it must be desorbed by increasing the temperature and reducing the solvent vapor par-

tial pressure. Steam stripping is usually used to obtain a steam/solvent vapor mixture which on condensing yields water and solvent. A distillation step is required in order to recover solvents which are water soluble. Case studies of coating operations and printing processes utilizing solvent vapor recovery are presented along with detailed cost breakdowns.

59164

APTIC NO. 82668

Try, Robert W. and David W. Campbell

METHOD AND APPARATUS FOR LIMITING THE CONCENTRATION OF COMBUSTIBLE VOLATILES IN DRYER EMISSIONS. (Moore Dry Kiln Co. of Oregon, Portland, Oreg.) U. S. Pat. 3,882,612. 8p., May 13, 1975. 12 refs. (Appl. July 27, 1973, 17 claims).

A method and apparatus for limiting the concentration of combustible volatiles in dryer emissions are described. The system is applicable to direct fired recirculating dryers and provide means for heating a portion of the recirculating drying gases to the combustion temperature of the entrained volatiles and thereby incinerating the volatiles to decrease their concentration in the dryer stack gases.

59165

APTIC NO. 79626

Tseytlin, M. A. and A. P. Karasev

ABATING POLLUTANT EMISSION IN FLUE GASES AT THE DONBASSENBERGO ELECTRIC POWER PLANTS. (Snizhenie vrednykh vybrosov s dymovymi gazami teplovykh elektrostantsiy Donbassenergo). Text in Russian. *Energ. Elektrif.*, no. 2:31-33, 1975.

Measures taken to abate pollutant emissions from the Donbassenergo electric power plants in the USSR are described. Old stacks are being replaced by high ones in the 150-320 m range to facilitate pollutant dispersion. Also, the number of the stacks is reduced in an attempt to centralize the emissions. Venturi scrubbers with efficiencies of 92-96% are installed for efficient ash capture. Electrostatic precipitators are being improved to achieve greater stability, especially during the firing of heavy fuel oil, and to reach efficiencies of 98-99%. Sulfur dioxide is removed from the flue gases at efficiencies of 97-98% by scrubbing with magnesia suspension.

59166

APTIC NO. 84150

Tsujimura, Kinji

DIESEL ENGINES. (Diizeru engin). Text in Japanese. Preprint, Fuel Society, Tokyo (Japan), Combustion Section, p. 29-38, 1975. (Presented at the Combustion Method of New Engines Seminar, Tokyo, Japan, June 9-10, 1975.)

The improvement of Diesel engines for the purpose of decreasing atmospheric pollution without losing economic efficiency is discussed. Combustion models were proposed for diesel engines. Then examinations were made of nitrogen oxides, exhaust, smoke, and hydrocarbon discharge. The discharge of nitric oxide is much more than that of nitrogen dioxide in diesel engines. To suppress the NO discharge, a change of the mixing ratio is ineffective. Most important is the lowering of combustion temperature. Mixing of water with the fuel is effective to lower the combustion temperature, but it is accompanied by the lowering of power output and an increase of HC discharge. The smoke discharge decreases. The formation of smoke occurs in the process of diffusion combustion, and not in the process of premixing combustion. Consequently, delay of ignition, lowering of the compression temperature, and a rise of ignition temperature of the fuels are effective to suppress smoke formation. Hydrocarbon discharge occurs when the mixing ratio is too high or too low. Large drops of fuel in fuel jets cause HC discharge. The liquid fuel that adheres onto the wall of the engine cylinder comes out as HC vapor if the temperature of the combustion chamber is too low for ignition. The white smoke that appears just after the starting of an engine originates in unburnt fuel. The rapid rise of the cooling water is important to suppress this smoke.

59167

APTIC NO. 82032

Tsukamoto, Youji and Sadao Kondo

METHOD FOR REMOVING A FLUORINE COMPOUND(S) FROM GASEOUS MIXTURE THEREWITH. (Mitsubishi Gas Chemical Co., Inc., Tokyo (Japan)) U. S. Pat. 3,907,522. 6p., Sept. 23, 1975. 4 refs. (Appl. April 26, 1974, 11 claims).

A method for the efficient removal of fluorine compounds, particularly boron trifluoride, from gas streams is described which precludes the escape of the fluoride hydrate as mist. The gas mixture is first introduced into a gas scrubber of the gas-liquid contacting type. The gas removed from the scrubber is then introduced into a mist-catching device which comprises a porous filter medium (mean pore size of 60 micron or less) and a nozzle or nozzles positioned above the surface of the medium. Water or an aqueous alkaline solution is sprayed on the surface of the filter medium in the same direction as that of the gas stream.

59168

APTIC NO. 82536

Tsuruta, Hidemasa

METHODS FOR THE TREATMENT OF WASTE GAS FROM CLAUS PROCESS. (Nittetu Chemical Engineering Ltd., Tokyo (Japan)) U. S. Pat. 3,895,101. 6p., July 15, 1975. 4 refs. (Appl. June 7, 1974, 5 claims).

A method for effective recovery of the sulfur component of the tail gas issuing from the Claus process without allowing it to be released into the atmosphere is described. The whole sulfur component of the tail gas is converted to sulfur dioxide which is subsequently recovered and circulated to the Claus process to be used as a reactant. Other processes of treating tail gases have the disadvantage of high construction and operating costs and secondary environmental pollution. The method consists of oxidizing by combustion the tail gas for converting the whole S component into SO₂. The resulting gas is mixed with a reducing combustion gas for lowering the residual oxygen content of the tail gas. The gas is cooled and introduced into a liquid capable of absorbing SO₂. The gaseous mixture is liberated from the liquid and the recovered SO₂ is circulated to the Claus process. (Author abstract modified)

59169

APTIC NO. 82145

Turner, William F.

VEE ENGINE WITH CENTRIFUGALLY ASSISTED SCAVENGING. (Turner Research, Inc., Graham, Tex.) U. S. Pat. 3,905,338. 9p., Sept. 16, 1975. 6 refs. (Appl. June 24, 1974, 20 claims).

An improved rotary vee engine of the angle piston type with conventional components has its intake and discharge passageways and ports critically positioned with respect to each cylinder so as to take advantage of the centrifugal force field and scavenge, via a critical flow pattern of incoming combustible mixture, the hot, less dense combustion products and waste gases toward the center of the rotary engine. Very nearly perfect scavenging occurs without overscavenging, thereby obtaining a good combustible mixture for firing. The respective inlet passageways terminate at the respective inlet ports in terminal ends disposed at critical angles to achieve the critical flow pattern. (Author abstract modified)

59170

APTIC NO. 82686

Uchitani, Hiroshi

DESULFURIZATION AND DECYANIZATION OF COG. (COG no datsurya oyobi datsu shian). Text in Japanese. *Nenryo Oyobi Nensho* (Fuel and Combustion), 42(12):1066-1072, Dec. 1975.

Carbon monoxide gas (COG) containing hydrogen sulfide and hydrogen cyanide are one of the causes of air and water pollution. Various desulfurization processes now exist, but some processes cause secondary pollution and others have trouble in recovering sulfur by-products effectively depending upon the

catalysts used. On the other hand, decyanization methods of chemical oxidation and oxidation by electrolysis are not economical. In the Fumaks-Rhodacs method developed by the Osaka Gas Co. for desulfurization and decyanization using ammonia contained in COG is introduced. The Sumitomo Chemical Engineering Co. is now constructing a plant which removes hydrogen sulfide and hydrogen cyanide from COG using the Fumaks-Rhodacs method, incinerates the waste solution from the process using the compax method and utilizes sulfur dioxide using the sulfuric acid method. The Fumaks-Rhodacs process is described in the following details: desulfurization and decyanization, factors for operational control and a tabulation of a principle index, study on corrosion, property of recovered sulfur, installation and operational specifications, compax method, and waste solution incineration facility and its achievement.

59171 APTIC NO. 82551

Uchiyama, Hisashi, Naohiko Meno, Teizo Senjo, and Makio Kobayashi

PROCESS FOR REMOVING SULFUR OXIDES FROM GASES. (Fuji Kasui Engineering Co., Ltd. and Sumitomo Metal Industries, Ltd. (Japan)) U. S. Pat. 3, 892,837. 13p., July 1, 1975. 5 refs. (Appl. June 14, 1973, 6 claims).

A process for efficiently removing sulfur oxides with a very high rate from combustion exhaust gas is described. Gas containing sulfur oxides is passed upwardly through a perforated plate or grid plate tower without weir and downcomer, having a free space ratio of 0.25-0.60. The gas in contacted counter-currently with liquid absorbent containing mainly calcium carbonate in aqueous suspension. This process does not have the problems of scaling or plugging that is common in conventional processes. Calcium absorbent wastage and expensive installation and running costs are avoided. (Author abstract modified)

59172 APTIC NO. 82288

Ueda, Sumio

APPLIED EXAMPLES OF RECENT BAG FILTER.

(Sakin no bagufuruta no oyo rei). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(11):1002-1008, Nov. 1975.

The advantages and disadvantages of three of the most highly efficient dust collectors (bag filters, venturi scrubbers, and cottrell precipitators) are reviewed. The following aspects of bag filters are discussed: classification of bag filters into open and closed systems, and bottom inlet and top inlet types; items to be investigated for deciding on the use of a bag filter; and recent examples of use at an iron plant, a steel plant, a foundry and a non-ferrous metal melting furnace. Highly efficient dust collectors are in demand because of stricter emission standards; the bag filter may be the answer because of its flexibility in accommodating the need for higher efficiency simply by selecting an appropriate filter material and velocity of filtration. New filtering materials have extended the usefulness of bag filters.

59173 APTIC NO. 79996

Ueda, Y.

REMOVAL AND RECOVERY DEVICE FOR PLASTICIZER MIST FUME; THE CENTRIFUMER.

(Kasozai misuto humu jokyo kaishu sochi; SENTORIHUMA ni tsuite). Text in Japanese. Enbi to Porima (Polyvinyl Chloride Polym.), 15(8):18, Aug. 1975.

A removing and recovery apparatus for plasticizer mist fumes, called Centrifumer and developed by the Nihon Mesh Engineering Co., is described. The apparatus employs a system of coalescence and impaction separation, in which fine particles are forced to pass through a small space where coalescence is encouraged by centrifugal force. The mist particles thus grown are collected by impaction separation filters of 4 different varieties. The pore size of the filters is finer down

stream. Several different capacities of Centrifumer are available for the range of 100 to 1000 cu m/min. These Centrifumers intercept particles even smaller than 1 micron.

59174 APTIC NO. 84046

Umehara, Hanji and Mitsuru Taira

EXHAUST MIXING INTAKE DEVICE OF INTERNAL COMBUSTION ENGINE. (Nainen kikan no haiki kongo kyuki sochi). Text in Japanese. (Toyota Motor Ci., Ltd. (Japan)) Japan. Model Util. Sho 50-35215. 4p., Oct. 14, 1975. 1 ref. (Appl. Sept. 17, 1969, claims not given).

An exhaust/air intake system for the internal combustion engine of an automobile, which will improve the warming of the engine after a cold engine start by mixing exhaust gas with air in the air inlet pipe of the engine is described. This process will also reduce the emission of uncombusted harmful substances in the exhaust emission gas. The system consists of an exhaust inlet valve installed at the exhaust manifold, an exhaust control valve which detects the temperature of the cooling water in the internal combustion engine, and an exhaust outlet valve installed at the intake manifold. Some of the exhaust gas passing the exhaust manifold is aspirated into the exhaust inlet valve, and the rate of the exhaust gas flow is controlled by the exhaust control valve. Then the exhaust gas passes through the exhaust outlet valve into the intake manifold. The pipes through which the exhaust gas flows are made of insulating asbestos yarn which is coated with a heat-resistant paint. In this manner, when the engine temperature is lower than the prescribed temperature at starting, the hot exhaust gas is mixed in the air/fuel mixture and supplied to the engine to improve ignition, combustion, and acceleration of the vehicle.

59175 APTIC NO. 82409

Upchurch, Lewis E.

TANDEM ROTOR ROTARY ENGINE. (Assignee not given.) U. S. Pat. 3,897,756. 7p., Aug. 5, 1975. 8 refs. (Appl. July 9, 1973, 5 claims).

A rotary engine consisting of two rotors mounted in tandem on a drive shaft in separate chambers is described. The rotors carry vanes which sweep the walls of the chambers. Disk gates rotating around axes perpendicular to the drive shaft divide the chambers into two sections and are slotted to permit the vanes to pass through. The engine is four cycle in operation. Intake and compression take place behind and ahead of the vanes in the first chamber, and expansion and exhaust take place behind and ahead of the vanes in the second chamber. Compressed gas from the first chamber is transferred to a separate combustion chamber where combustion is initiated, and the expanding gas is transferred to the second rotor chamber. This engine has more efficient combustion and cleaner exhaust characteristics than other engines. (Author abstract modified)

59176 APTIC NO. 83674

Urlaub, A.

STUDY OF THE QUESTION OF THE EXHAUST GAS QUALITY OF DIRECT INJECTION AUTOMOBILE DIESEL ENGINES. (Untersuchungen zur Frage der Abgasqualitaet direkteinspritzender Fahrzeugdieselmotoren). Text in German. Preprint, Technische Akademie Wuppertal, Wuppertal (Federal Republic of Germany), 3p., 1975. (Presented at the Automobile Exhaust Gas Decontamination Seminar, Wuppertal, Federal Republic of Germany, Feb. 3-4, 1975.)

Factors influencing the exhaust gas quality in direct injection vehicle diesel engines were studied. It was possible to reduce the nitrogen oxides plus hydrocarbon emission by up to 30% by delaying the initiation delivery of the fuel injection pump. Even greater reduction is possible by load-dependent modification of the initiation of delivery. The aldehyde emissions relative to fuel consumption decrease rapidly with increasing tem-

CONTROL METHODS

59182

perature above a critical temperature of about 500 C. This temperature must be exceeded by at least 80 C to achieve more or less complete combustion and accordingly low aldehyde emission. The aldehyde emissions can be reduced efficiently by increasing the idle exhaust gas temperature to over 200 C, or by catalytic exhaust cleaning.

59177

APTIC NO. 80316

Ushio, Shota

JAPAN S NOX CLEANUP ROUTES. *Chem. Eng.*, 85(15):70-71, July 21, 1975.

Technology for removing nitrogen oxides in offgases from nitric acid units and from furnaces and boilers in refineries and petrochemical plants in Japan is summarized. Dry catalytic routes using ammonia as a reducing agent for NOx are available from several firms. The Hitachi Zosen process can bring NOx inlet loadings of 350 ppm and higher down to 10 ppm and less on the outlet side. The Higashi Nihon Methanol system removes 80-90% of the NOx carried in 200,000 cu m/hr of off-gas from a heating furnace fired with liquefied petroleum gas. The joint Mitsubishi Petrochemical/Hitachi system features a removal efficiency of 90+%. Chiyoda has developed a process for simultaneous NOx and sulfur dioxide removal. A 1000 cu m/hr pilot plant is onstream.

59178

APTIC NO. 79781

Usui, K.

MALODOR CONTROL MEASURES IN CHICKEN RESIDUE PROCESSING, MAINLY HYDROGEN SULFIDE CONTROL IN FEATHER TREATMENT. (*Shokukeiniku no fukashoku zanshutsu to sono shorikako ni okeru akushu boshi taisaku: Shu to shite hanega shori deno ryukashiso taisaku ni tsuite*). Text in Japanese. *Akushu no Kenkyu* (Odor Research J. Japan), 4(20):50-59, May 1975.

The production of hydrolyzed feather meal from chicken feathers yields malodorous gases containing hydrogen sulfide. The type of steam cooker, the structure of cookers, and the types of condensation system (water jet ejection system, combinations of surface condensers and vacuum pumps, combinations of surface condensers and jet ejectors, and fume condensers) are described. Control measures for malodorous waste water include the use of a closed system for circulating cooling water. Waste water treatment by means of an activated sludge process, and treatment of the aeration gas by activated carbon adsorption, chemical scrubbing, and combustion deodorization are discussed. A master plan for a control system for a feather meal plant is given with design specifications, H2S concentration calculations, and a flow sheet. The exhaust gas from the fume condenser, circulation tank, and waste water tank is treated with desulfurization agent LMN and then deodorized by direct combustion in a deodorization furnace.

59179

APTIC NO. 84457

Van Ginneken, A. J. J.

FUEL CLEANING AND CONVERSION. CLEANING OF OIL. INTRODUCTORY REPORT. Preprint, *Economic Commission for Europe*, 12p., 1975. 4 refs. (Presented at the *Desulphurization of Fuels and Combustion Gases Seminar*, 2nd, Washington, D. C., Nov. 11-20, 1975.)

The technology of fuel oil desulfurization processes is reviewed. Eight processes are available for the desulfurization of atmospheric and vacuum residues that have metal contents not exceeding 150 to 250 ppm. The rate and attainable degree of desulfurization, the hydrogen consumption, and the catalyst life depend on the design of the unit and on the constitution of the feedstock. All published processes, except one apply the trickle flow principle in fixed bed reactors. Cost estimates are included for some of the processes.

59180

APTIC NO. 80235

Varde, Keshav S.

A UNIFIED ANALYSIS OF HYDROGEN FUEL FOR PASSENGER CARS FROM POLLUTION AND PERFORMANCE POINT. *Michigan Univ., Dearborn, Dept. of Mechanical Engineering, Intersoc. Energy Conversion Eng. Conf. Proc.*, 10th, 1975, p. 136-141, 23 refs. (Aug. 18-22.)

The levels of nitric oxide emitted from a hydrogen fueled internal combustion engine, and the performance of such an engine under different operating parameters were investigated. Nitric oxide prediction is based on a model that incorporates the essential kinetic mechanism for the formation and decomposition of NO and other species thought to be important in the reaction scheme. The model study is based on the assumption that the mixture is carbureted and is in a state of complete homogeneity prior to ignition. Predictions made with some simplifying assumptions show behavior similar to previous experimental data. Using a leaner mixture gives a low specific NO in the exhaust gases. Nitric oxide is the only major pollutant emitted by the engine. The advantages of lean operation are discussed. Because of its wide flammability limits, hydrogen can be used either as a supplemental fuel with regular gasoline as the main fuel or by using stratification, both of which would have low nitric oxide and high thermal efficiency. (Author abstract modified)

59181

APTIC NO. 82885

Vartanian, Richard D.

CARBURETOR VENTURI VACUUM AND ENGINE MANIFOLD VACUUM CONTROLLED EXHAUST GAS RECIRCULATING. (*Ford Motor Co., Dearborn, Mich.*) U. S. Pat. 3,878,823. 4p., April 22, 1975. 3 refs. (Appl. Sept. 24, 1973, 1 claim.)

A system for controlling the recirculation of exhaust gases of internal combustion engines back into the engine through the intake manifold is described. The engine has a duct connecting the exhaust gas crossover passage to the intake manifold. The duct normally is closed by a load and speed sensitive valve whenever manifold vacuum acting on the valve exceeds an amplified carburetor venturi vacuum acting on the valve in the opposite direction. The duct is opened when the amplified venturi vacuum exceeds manifold vacuum except at high speed and load conditions. Prior art devices vary the exhaust gas recirculation (EGR) as a function of load only, by varying EGR flow as a function of manifold vacuum levels. This device varies EGR flow as a function of both speed and load so that the flow is a more nearly constant percentage of the airflow. (Author abstract modified)

59182

APTIC NO. 83912

Vasileenko, K. I., B. F. Voytkovskiy, S. V. Kulyasova, and E. S. Kurakina

METHODS TO REDUCE WASTES IN THIOCYANATE PRODUCTION. (*Puti snizheniya otkhodov pri proizvodstve rodanistikh soley*). Text in Russian. *Koks i Khim.*, 24(7):41-42, 1975.

Pollution-reducing methods in thiocyanate production are presented. At today's level of technological development, the final output of thiocyanates goes into tailings, together with used-up activated carbon. A method providing for the purification of the working solutions with activated carbon at 2 intakes: in the neutralizing reactor vessel, and in the precipitating reactor vessel, is described. From there, the activated carbon and precipitates proceeded to filter presses and then to the tailings as industrial waste. The major portion of the thiocyanates and a significant quantity of the activated carbon were discharged after passing through the precipitator. Substantial part of the waste after neutralization was sulfates. Discharge of used-up activated carbon and of precipitates resulted in a rapid contamination of the water tank with thiocyanates and a loss of usable products. Therefore, the used-up

carbon had to be returned to the cycle. It was regenerated with hot condensates and could be re-used to purify the working solution in the neutralizer and precipitator. The exhausted carbon was regenerated with hot condensates by means of an agitator in the reservoir and the suspension was pumped onto the filter press. The dried coal was returned to the neutralizer by conveyors. In order to prevent coal particles from getting back into the cycle and causing contamination, the scrubber nozzles had to be equipped with fine filters for rinsing water. The suggested utilization of industrial wastes led not only to a reduced cyanate discharge into the tailings, but also decreased the specific outlay of activated carbon for the purification of the solution and loss of sodium thiocyanate which should be reflected in the production cost.

59183

APTIC NO. 83297

Velegol, John L.

METHOD AND APPARATUS FOR REMOVING HEAT AND ELEMENTS FROM EXHAUST. (Assignee not given.) U. S. Pat. 3,884,651. 8p., May 20, 1975. 11 refs. (Appl. Dec. 30, 1971, 18 claims).

A method and apparatus for removing heat and elements from exhaust are described. The device consists of a closed container partially filled with liquid with exhaust gas inlet and outlet devices. Internal structure provides a path for the gases between the inlet and outlet devices, and while passing along the path, the gases are passed through the liquid which absorbs heat from and removes elements from the gases. Various devices can be used to agitate the liquid. Automatic controls and operators are used to maintain desired liquid level. Outlets are provided to remove collected sludges or elements. Heat exchangers using conduction, radiation, and convection principles of heat transfer are added to utilize recovered heat energy. (Author abstract modified)

59184

APTIC NO. 83391

Verdier, C. and A. Mestre

REDUCTION OF CARBON MONOXIDE EMISSION FROM AUTOMOBILES BY AIR INJECTION INTO THE EXHAUST GAS. (Reduction d l emission d oxyde de carbone d um moteur d automobile par injection d air dans les gaz d echappement). Text in French. *Entropie*, 11(63):12-17, 1975. 1 ref.

The carbon monoxide content in exhaust gases of automobiles has been cut down by post-combustion, by injecting air downstream from the exhaust valves. The optimum air flow corresponds to the stoichiometric ratio and to a reduction factor of 10-100 of the carbon monoxide concentration, depending on the original mixture ratio. Destruction of carbon monoxide can reach 90-99%. It has been experimentally shown that the process is effective in cases of idling with a hot engine (traffic jams), and with a cold engine and an open choke (starting the engine).

59185

APTIC NO. 82017

Vest, Eugene W.

VAPOR SEAL FOR FUEL TANK FILLER TUBE. (Texaco Inc., New York) U. S. Pat. 3,903,942. 6p., Sept. 9, 1975. 3 refs. (Appl. Nov. 6, 1972, 7 claims).

A vapor seal member adapted to be received within the filler neck of an automobile fuel tank for the prevention of gasoline vapor escape during fueling is described. The vapor seal member includes a peripheral lip which firmly engages the terminal rim of the filler tube. A central resilient segment of the seal member defines an access opening which receives the discharge tube of the nozzle so as to form an annular vapor tight seal with the latter, thus avoiding the passage of fuel vapors from the tank. (Author abstract modified)

182

AIR POLLUTION ABSTRACTS, JUNE 1976

59186

APTIC NO. 80287

Vickers, V. T. and A. G. McRobert

ATMOSPHERIC TESTING TO DETERMINE THE EFFICIENCY OF AIR-FILTRATION REQUIRED FOR FOOD PROCESSING PLANTS. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 421-442. 5 refs. (Feb. 17-21.)*

Indoor and outdoor air samples were collected at a number of dairy processing plants to determine the efficiency of air filter media in ventilation systems designed for food processing areas and for areas where air is used for direct product drying and cooling or for pneumatic conveying of unpackaged food products. Indoor bacterial counts averaged between 0.08 and 0.25/cu m, while outdoor counts average between 0.06 and 21/cu m. About 87% of the larger non-viable dust particles in fresh unfiltered air was over 10 micron in diameter, while only 36% of the dust in filtered air was over 10 micron. The recommended minimum efficiency for air filter media in mechanical ventilation systems designed for food processing plants using only fresh air is 80% when challenged by number 2 dust in the British Standard air filter test. Where the numbers of microorganisms in the air outside the ventilation inlet exceed about 200 colony forming units/cu m, air filter media of higher efficiency are preferred. Filter media capable of at least the same filtration efficiency are recommended for air used in the drying and cooling or pneumatic conveying of powdered or granulated food products.

59187

APTIC NO. 82170

Vilella, Tony R.

INTERNAL COMBUSTION ENGINE. (Assignee not given.) U. S. Pat. 3,905,344. 15p., Sept. 16, 1975. 9 refs. (Appl. Jan. 11, 1974, 8 claims).

An internal combustion engine has an exhaust opening in the cylinder wall spaced from the head end of the cylinder a distance equal to a major portion of the stroke of the piston in the cylinder. The invention also includes an exhaust valve in the head end of the cylinder communicating with an exhaust recycling conduit adapted to recycle exhaust gases into an intake manifold, and a flow valve intercommunicating with the recycling conduit and the intake manifold for coordinating or modulating flow of recycled exhaust gases into the intake manifold in relation to fuel being conducted to the fuel inlet valve. The most efficiently burned combustion products at the surface of the piston are first exhausted through the exhaust port in the side wall of the cylinder to atmosphere, and the relatively poorly or unburned gases remain in the cylinder at the head end to be recycled through an exhaust valve and back through a recycling conduit to the fuel inlet manifold which communicates with the intake valve in the head end of the cylinder and combustion chamber of the engine. The invention also includes an exhaust valve in the port in the side wall of the cylinder to prevent raw fuel from escaping during the start of the compression stroke. Some of the relatively poorly or unburned gases are conducted from the recycling conduit to an exhaust manifold receiving hot gases from the exhaust port. This portion of the exhaust gases is mixed with the hot gases passing from the exhaust gas outlet and burned in the exhaust manifold. (Author abstract modified)

59188

APTIC NO. 83205

Vilella, Tony R.

INTERNAL COMBUSTION ENGINE. (Assignee not given.) U. S. Pat. 3,875,914. 14p., April 8, 1975. (Appl. April 23, 1973, 7 claims).

A four-cycle internal combustion engine is described. Combustion chambers and cylinders are provided with a head end and with pistons reciprocally mounted. Intake and exhaust valves are connected with the head end of the cylinder. A stratifying exhaust port and valve are located in the side wall of the cylinder a substantial distance from the head end of the cylinder. Strata of exhaust gases are exhausted from areas ad-

CONTROL METHODS

59193

jacent the top of the piston as the piston passes the respective exhaust port in the side wall of the cylinder. Conventional four-cycle engines require the application of various accessories and equipment to the induction and exhaust systems of these engines in order to reduce the undesirable gaseous emission from the exhaust. (Author abstract modified)

59189

APTIC NO. 84144

Virkola, N. E.

THE SITUATION OF A CALCIUM BISULPHITE PULP MILL WITH REGARD TO INTENSIFIED CLAIMS FOR ENVIRONMENTAL PROTECTION. (*Die Position einer Kalziumbisulfidfabrik, besonders im Hinblick auf verschärfte Umweltschutzforderungen*). Text in German. Papier (Darmstadt), 29(10A):14-25, 1975. 7 refs.

A project to convert calcium bisulfite pulp mills in Finland into sulfate pulp mills to reduce pollution was discussed. Reasons for the conversion include higher water consumption, higher BSB7 values and a generally better sulfate pulp product, although a more intensive recovery of the spent liquor and better handling of condensates could reduce BSB7 and water consumption in modern bisulfite mills. A comparison of sulfite and sulfate mill emissions showed, for a sodium bisulfite mill, 1-2 kg/t of hydrogen sulfide, and for a calcium bisulfite mill, 50-75 kg/t of sulfur dioxide and 8-20 kg/t of solids; for the latter, the values were 1-3 kg/t of H₂S, 1-2 kg/t of organic sulfur compounds, 5-12 kg of SO₂ and 1-2 kg/t of solids. A model for a nearly pollution-free calcium-bisulfite pulp mill was developed adjustable to a magnesium or sodium sulfite process. It was designed for the production of 100,000 t/yr of bleached pulp and projected to close down the entire water system, including bleaching and screening of the bleached pulp. The suggestion was partly based on preventing concentrations of chlorides derived from the bleaching sewage. They leave as free hydrochloric acid due to combustion of the spent liquor with smoke gases and were recovered by being absorbed into water. On a laboratory scale, 2 tests were performed to clarify problems linked to the closing down of the chlorination process at the start of the bleaching and of the subsequent alkaline phase. In the first process, the circulation of the chlorination phase was carried out, then washed and the filtrate obtained was used to dilute the pulp from 10-3.5%. In the second process, the countercurrent washing method was applied with the washing filtrate of the alkaline step used for pulp washing after chlorination. Investment for the 100,000 t/yr bleached pulp mill varied from 78-87 million dollars for Ca, Mg, and Na-sulfite mill. Increased investment cost for sewage processing was 10 million dollars.

59190

APTIC NO. 82984

Vits, Hilmar

METHOD AND APPARATUS FOR PURIFYING EXHAUST AIR OF A DRYER APPARATUS. (*Vits-Maschinenbau GmbH, Langenfeld (Federal Republic of Germany)*) U. S. Pat. 3,875,678. 6p., April 8, 1975. 5 refs. (Appl. Jan. 4, 1974, 11 claims).

A method and apparatus for purifying exhaust air of a dryer apparatus are described. The products being dried normally produce gaseous hydrocarbons which cannot be discharged directly into the atmosphere, but which must be treated. A two-sectioned dryer in series in which the material being dried passes from section to section is described. In the first section, the more volatile hydrocarbons are driven off and are afterburned. The heat of combustion is recovered and used to heat the dryer sections. The second section has less volatile hydrocarbons driven off which are washed or condensed. The hydrocarbons precipitating out during washing are used as a fuel to assist in the afterburning of the more volatile hydrocarbons. The ashed exhaust from the second section and exhaust gases from afterburning of the more volatile hydrocarbons are combined after washing and after burning for dehumidification of the washed exhaust and discharged directly into the atmosphere. This system uses a reduced amount of heat, compared to other systems. (Author abstract modified)

59191

APTIC NO. 82045

Vlnaty, Joseph

METHOD AND APPARATUS FOR CARBONIZING AND DESULFURIZING COAL-IRON COMPACTS. (*Dravo Corp., Pittsburgh, Pa.*) U. S. Pat. 3,908,970. 6p., Sept. 30, 1975. 5 refs. (Appl. Aug. 9, 1973, 3 claims).

A method and apparatus for carbonizing and desulfurizing coal iron compacts to produce low sulfur content carbonized compacts of coal char and iron for use producing iron are described. There is no other process for desulfurizing compacts for metallurgical processing. Compacts of conventional coals, containing more than 1% sulfur, and iron oxides or iron metal are carbonized and desulfurized by heating the compacts to a temperature in the range of 1200-1800 F in an enclosed reactor and contacting the heated compacts with a gas containing elemental hydrogen. The H₂ reacts with S to produce hydrogen sulfide, while the heated coal is carbonized and releases carbonization off gases. The H₂S is removed from the off gases either by exhausting both from the reactor, followed by conventional separation, or by using as the solid heat carrier a solid which acts as an S acceptor to remove the H₂S. The acceptor is regenerated, reheated, and returned to the reactor. The off-gases can be used as fuel after separation of the H₂S. The carbonized and desulfurized compacts are separated from the solid heat carrier and cooled to provide valuable low S content carbonized coal compacts containing metallic iron and are especially suitable for use in the production of iron in a blast furnace.

59192

APTIC NO. 70726

Voelker, Frank C., Jr.

A CONTEMPORARY SURVEY OF COKE-OVEN AIR EMISSIONS ABATEMENT. *Iron Steel Engr.*, 1975:57-64, Feb. 1975. 11 refs.

The sources control of coke oven air emissions are reviewed. Oven charging accounts for the major amount of emissions from all sources. The amount varies depending upon equipment design and operating practices. There are three concepts in use of controlling charging smoke: the external collection and cleaning of gases from the larry car or standpipes; collection of gases in the collecting main system; and pipeline charging. Oven pushing is an emission source that varies widely from plant to plant and is caused by pushing green coke. Coke guide hoods were developed in the 1960s. Emissions are collected in the hood and conducted to the gas scrubbers, which are mounted on the coke-guide car. Coke quenching causes large amounts of steam to be generated and some particulate matter. Several designs of suppressors are available including wooden baffles, coke beds, and back sprays. The majority of installations use wooden baffles. When properly maintained, baffles can remove most of the entrained particulate matter. The drizzle of the water from the quenching plume can be a problem in the plant.

59193

APTIC NO. 76416

Volgin, B. P., N. Y. Nikulin, V. P. Rychkov, I. A. Prokhorov, and V. E. Kharmats

INVESTIGATION OF A PILOT GAS CLEANING EQUIPMENT OF A LARGE-CAPACITY OPEN FERROALLOY SMELTING ELECTRIC-ARC FURNACE. (*Issledovanie opytno-promyshlennykh gazoochistok moshchnoy otkrytoy ferrosplavnoy elektropechi*). Text in Russian. Prom. Energ., no. 3:14-15, 1975. 3 refs.

Experiments with a pilot dust separator system installed at a large-capacity open ferroalloy smelting electric-arc furnace are described. The dust separator system was composed of a battery of 10 venturi scrubbers with a throat diameter of 200 mm and of a rectangular venturi scrubber measuring 0.25 by 1.8 m. As shown by the experience gained during the initial operation of the venturi scrubbers, high dust separation efficiency required an increased hydraulic pressure together with corresponding increases in the specific water consumption and of

the gas flow rate. The residual dust concentration was found to decrease with increasing hydraulic resistance. Residual dust concentrations of 0.069-0.089 g/cu m were reached at a minimum hydraulic resistance of 1200 mm of water column, at gas flow rates of 180-215 m/sec, and a specific water consumption of about 1.8 liter/cu m. The throat diameter of the venturis had to be reduced to 100-150 mm.

59194

APTIC NO. 82312

Voorheis, Temple S. and Ralph R. Vosper

METHOD FOR REDUCING BURNER EXHAUST EMISSIONS. (Coen Co., Inc., Burlington, Calif.) U. S. Pat. 3,890,084. 9p., June 17, 1975. 9 refs. (Appl. Sept. 26, 1973, 16 claims).

A method for reducing the emission of nitrogen oxides from furnaces is described which does not compromise the efficiency of the furnace or increase the emission of other pollutants. The method is relatively inexpensive compared to prior art techniques and is ideally suited for modifying small and intermediate size existing furnaces. The method involves operating the furnace with low excess air (about 5% more than the theoretically required minimum air volume). The fuel is combusted so that the maximum flame temperatures are less than the theoretically obtainable maximum temperature. This is achieved by cooling the flames through contact with the combustion chamber walls and by combusting central portions of the flames in two stages. Burners in a lower vertical bank are initially fired with insufficient air, while burners in an upper burner bank are fired with additional air to make up for the air deficiency of the lower burners. The additional air is mixed with the uncombusted fuel from the lower burners, and the fuel is burned at a later stage downstream of the burners. (Author abstract modified)

59195

APTIC NO. 82388

Wade, William D.

FILTER AND SORBENT CARTRIDGE. (King Engineering Corp., Ann Arbor, Mich.) U. S. Pat. 3,891,417. 5p., June 24, 1975. 7 refs. (Appl. Jan. 28, 1974, 18 claims).

A filter cartridge for removing liquid contaminants from a gaseous fluid is described which provides for a progressive color change indication toward the end of its useful life. The filter consists of a bed of sorbent medium disposed between inner and outer rigid tubes formed of glass microfibers. The inner tube acts as a first filtering stage by condensing or coalescing a majority of the dispersed contaminant from the gas, and the outer tube acts as a polishing filter for removing most of the contaminants not removed by the inner tube and the bed of sorbent medium. The outer tube acts as a polishing filter for removing most of the contaminants not removed by the inner tube and the bed of sorbent medium. The use of a dye substance disposed in the bed between the inner and outer fiber tubes provides a color change indicating before the filtering effectiveness of the cartridge is seriously impaired. (Author abstract modified)

59196

APTIC NO. 83166

Wagner, Melvin H.

CATALYTIC CONVERTER HOUSING. (Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,899,302. 5p., Aug. 12, 1975. 6 refs. (Appl. Nov. 23, 1973, 2 claims).

An improved automatic catalytic converter capable of operating for long periods at inlet outlet gas temperature differentials of 1000 C or more is described. It contains a floating bed of particulate catalyst. An anti-backfire pin maintains the spacing between the bed and the inlet housing cover and prevents any deformation caused by a sudden increase in inlet gas pressure due to the presence of excess oxygen and unburned hydrocarbons downstream of the exhaust valves. The catalyst bed or chamber is defined by a pair of facing, dish shaped members drawn from a perforated metal screen and welded to each other along circumferential radial flange portions. The

AIR POLLUTION ABSTRACTS, JUNE 1976

anti-backfire pin is centrally mounted for rocking movement relative to the housing under thermal exercising. (Author abstract modified)

59197

APTIC NO. 82301

Wahl, Josef

METHOD AND SYSTEM TO REDUCE NOXIOUS COMPONENTS IN THE EXHAUST EMISSION FROM INTERNAL COMBUSTION ENGINES WITH CARBURETOR SUPPLY. (Robert Bosch G.m.b.H., Gerlingen-Schillerhohe (Germany)) U. S. Pat. 3,890,946. 9p., June 24, 1975. 5 refs. (Appl. June 12, 1974, 22 claims).

A carburetor-fuel injection system that permits lean operation of internal combustion engines and thus reduced exhaust emissions is described. The system is less expensive and more responsive than previously proposed dual carburetor systems. The carburetor in the system is set to provide a slightly lean mixture, e.g., an air number of 1.1. A fuel injection valve is located in the induction tube or inlet manifold to the engine, and the opening time of the valve is controlled as a function of inlet manifold pressure or other operating parameters so that the overall fuel-air mixture is just under the stoichiometric level, e.g., an air number of approximately 0.98. Carbon monoxide and hydrocarbon emissions are thus kept to a minimum, and a reducing atmosphere in the exhaust is maintained for the control of nitrogen oxides in a catalytic converter. (Author abstract modified)

59198

APTIC NO. 76571

Wakaizumi, A. and T. Inada

NITROGEN OXIDES REMOVAL EQUIPMENT AND LOW TEMPERATURE ADSORPTION TYPE OZONE SUPPLYING EQUIPMENT. (Chisso sankabutsu jykoku sochi to teion kyuchakushiki ozon kyokyu sochi). Text in Japanese. Anzen Kogaku (J. Japan Soc. Safety Eng.), 14(5):367-375, 1975. 4 refs.

Descriptions of a denitrification device and low temperature adsorption type ozonizer developed by the Nippon Oxygen Co. are given. The wet type denitrification device is designed for exhaust gas at room temperature with relatively high nitrogen oxides concentrations (exhaust gas from nitric acid plants and metal surface treatment plants). The KNA process consists of an oxidation tower, a mist remover, first and second alkali towers, and a waste water treatment tower. The NOx is oxidized with HNO3 to adjust the ratio of nitric oxide to nitrogen dioxide to about unity for efficient alkali absorption (sodium hydroxide solution in the first tower, an alkali reducing agent solution such as sodium sulfide and sodium thiosulfate in the second tower). The NOx removal rate is above 90%. Two models (10,000 N cu m/hr and 5000 N cu m/hr) were developed. In the low temperature adsorption ozonizer, the ozone produced using oxygen as a starting material is adsorbed to a low temperature adsorber and later desorbed by purging with dried nitrogen or air. The production cost of O3 is reduced by 20-30% compared to the method using air as the starting material.

59199

APTIC NO. 83956

Wakaizumi, A. and T. Inada

REMOVING EQUIPMENT OF NITROGEN OXIDES AND LOW-TEMPERATURE ADSORPTION-TYPE OZONE SUPPLYING EQUIPMENT. (Chisso sankabutsu jykoku sochi to teion kyuchaku shiki ozon kyokyu sochi). Text in Japanese. Anzen Kogaku (J. Japan Soc. Safety Eng.), 14(5):367-375, Oct. 1975. 4 refs.

A nitrogen oxides removing apparatus was developed. Waste gases from a sulfuric acid manufacturing process or a metal surface treatment process were introduced into an oxidizing tower in which NOx were oxidized by nitric acid. The resulting gas was pumped through a mist removing tower to the first and the second alkali towers. Clean gas was released from the second alkali tower. Test results showed that NOx concentra-

CONTROL METHODS

tions could be reduced from 5000 ppm to 140 ppm, or 97.2% removal. The apparatus is applicable to a wide range of treating capacities ranging from 50 N cu m/hr to 10,000 N cu m/hr. A 10% nitric acid solution was recovered as by-product from the mist removing tower. A small compact apparatus utilizing the same process was also developed by using only one tower. The NO_x concentration of a waste gas (6 N cu m/hr) was reduced from 10,000 ppm to 95 ppm.

59200

APTIC NO. 79640

Waldheim, M.

ASPECTS OF THE CONSERVATION OF CLEAN AIR.

(Aspekte zur Reinhaltung der Luft). Text in German. Technik, 30(4):271-275, 1975. 13 refs.

General hygienic and technical aspects of the abatement of air pollution due to particulate matter are discussed. The dust discharge can be principally abated by improved technologies which produce a reduced amount of particulates, by dust separators, by dilution through the use of high stacks, and by maintaining great distances between dust emission sources. Dust separation is possible by dry cyclones, wet type scrubbers, bag filters, and electrostatic precipitators. The latter are especially suitable due to the low energy consumption and high efficiency. The efficiency of dust separation is dependent on the degree of waste gas capture and of the fractional separation efficiency. It is important to design dust separators for the separation of the fine respirable dust fractions at high efficiency as these fractions are most hazardous to human health.

59201

APTIC NO. 82002

Wall, Bruce Irving, Henry Clinton Harris, and Jose Luis Arnaud

PROCESS FOR SEPARATING SULFUR OXIDES FROM GAS STREAMS. (FMC Corp., New York) U. S. Pat. 3,911,084. 7p., Oct. 7, 1975. 3 refs. (Appl. Feb. 20, 1973, 13 claims).

A wet scrubbing process for the removal of sulfur dioxide from waste gases is described which overcomes problems of equipment plugging associated with prior art processes. Sulfur dioxide is removed by contacting the waste gas stream with a sodium sulfite-sodium bisulfite extraction liquor having a pH of at least 6. A portion of the SO₂-containing extraction liquor is regenerated by adding calcium hydroxide to raise the pH of the liquor to about 8-10. Sulfur dioxide is removed as calcium sulfite precipitate in the regenerated extraction liquor. The solids-free regenerated extraction liquor is then mixed with SO₂-containing extraction liquor to maintain the pH at a minimum of 6. (Author abstract modified)

59202

APTIC NO. 82165

Wallis, Marvin E.

PISTON ENGINE EMPLOYING HYDRAULIC MOTION CONVERSION. (Assignee not given.) U. S. Pat. 3,905,339. 8p., Sept. 16, 1975. 4 refs. (Appl. Oct. 23, 1973, 25 claims).

A piston engine employs a flywheel rotor, in lieu of a crankshaft, driven hydraulically by the piston. One end of a plunger is connected to the piston, the other end being slidably disposed in a hydraulic cylinder. In the combustion mode, fuel and oxygen are injected and spark ignited, both by the same variable speed direct current speed control motor. The piston-driven plunger displaces hydraulic fluid in the cylinder through a high speed orifice to impinge against spaced cavity surfaces formed along the periphery of the flywheel rotor, thereby spinning the rotor. A slide valve is disposed in the orifice and is hydraulically connected to the cylinder so that pressure changes in the cylinder reciprocate the slide valve to provide momentary delay, during pressure build-up, and then release of the cylinder fluid, thereby increasing the fluid velocity. Hydraulic fluid is recirculated during an exhaust stroke wherein the piston is returned by injected air pressure. Since

the piston is not coupled directly to the flywheel rotor, the only effect of preignition is to lose power. The absence of preignition problems makes it possible to use oxygen to replace part or all of the air, enabling the elimination or substantial reduction of oxides of nitrogen and a greater conversion of carbon monoxide to carbon dioxide. Closer control over fuel usage and combustion is possible, decreasing the amount of unburned hydrocarbons in the exhaust. (Author abstract modified)

59203

APTIC NO. 83824

Watanabe, Sadaharu

DUST REMOVING APPARATUS OF COKE OVEN.

(Kokusuro no jojin sochi). Text in Japanese. (Shinwa Boeki K. K. (Japan)) Japan. Model Util. Sho 50-35091. 4p., Oct. 13, 1975. 2 refs. (Appl. Feb. 11, 1966, claims not given).

A compact dust removing device for coke ovens, which effectively removes dust consisting of powdered coal from the feeding of coal into the coke oven is described. In a coal calcination plant, coke ovens installed in parallel lines with multiple coal inlets on the top release a large amount of hot gas containing dust when coal is being fed through the coal inlets into the coke oven. This pollutes the working environment, and forms an explosive mixture with the air. Conventional dust removing devices are required for each coke oven for removal of dust, which necessitates an enlarged expensive exhaust system. The new process solves the above problem by presenting a wet type dust collector attached to the coal cart. The coal cart has feed tanks with a hopper at the bottom for each coal inlet of the coke oven, and runs on rails on top of the coke ovens along the coal inlets. The wet type dust collector consists of an air aspirator, a waste sprayer, and a water tank. The hoppers of the feed tanks connect to the coal inlets of the coke oven when the coal cart stops above the coal inlets. The dust aspirating pipe of the air aspirator is installed on the side wall of each hopper.

59204

APTIC NO. 82317

Watanabe, Takefumi, Toshio Yoneya, and Yasuo Miyaji

STACK GAS DESULFURIZATION BY ZINC OXIDE ABSORPTION METHOD. (Sanka aen kyushuho ni yoru haen datsuryu). Text in Japanese. Ryusan to Kogyo (Sulfuric Acid Ind.), 28(12):277-279, Dec. 1975. 5 refs.

A zinc oxide desulfurization system was developed for a stabilized liquid sulfuric anhydride production plant attached to a zinc refinery. The sulfur oxides in off-gas from the final absorption tower are absorbed by cyclone ashes produced in the zinc refining fluid roasting furnace and recovered as sulfuric acid. The desulfurization system consists of an absorption process using a cross-flow type absorber with a 95% desulfurization rate, where sulfur dioxide is absorbed as zinc sulfite and zinc bisulfite; a filtration process where absorbent slurry is separated from the filtrate; a regeneration process where the filtration residue containing about 30% water is heated at 980 C in an FS furnace and decomposed to ZnO; and a sulfuric acid recovery process where the flue gas from an FS furnace containing about 10 vol% of SO₂ is recovered at 98% H₂SO₄ using a catalytic H₂SO₄ processing system. The desulfurization system, design factors, and operation record are described. The SO_x concentration in the final discharge gas is 20-60 ppm; and the desulfurization rate is 95-98%.

59205

APTIC NO. 82389

Watanabe, Tamotsu

ELECTROSTATIC DUST COLLECTOR FOR EXHAUST GASES CONTAINING FINE PARTICLES. (Nippon Kogei Kogyo Co., Ltd., Tokyo (Japan)) U. S. Pat. 3,891,415. 9p., June 24, 1975. 16 refs. (Appl. Sept. 28, 1972, 5 claims).

An electrostatic dust collector with improved efficiency for particles with diameters of less than 1 micron is described. A

lattice-type particle aggregating means is positioned upstream of the dust collecting zone. A charged electrode connected to a high voltage direct current generator and a dust collecting electrode maintained at ground potential establish the electrostatic field for dust collection. A weak electrostatic field is also maintained between the particle aggregating means and the charged electrode. The passage of the particle-contaminated gas through the aggregating means results in the formation of coarser particles which are deposited on the dust collecting electrode. Humidifying means may be provided upstream of the aggregating means to aid in the aggregating process. (Author abstract modified)

59206

APTIC NO. 83701

Watson, H. C., E. E. Milkins, and J. V. Deslandes

EFFICIENCY OF AND POLLUTION GENERATED BY HYDROGEN- OR METHANE- POWERED SPARK IGNITION ENGINES. (*Rendement et pollution des moteurs a allumage commande consommant de l'hydrogene ou du methane*). Text in French. *Sciences Techniques*, no. 26:25-32, Oct. 15, 1975. 21 refs.

A monocylinde can be satisfactorily fed by continuous injection of methane into the collector to produce a premixed explosive charge. At speeds of over 900 rpm, hydrogen fuel requires a low pressure injection nozzle in order to prevent the return of the flame to the collector. This is characteristic of hydrogen due to the extent of its flammability. By delaying the entry of hydrogen into the admission valve, the residual gases are cooled by the pure air before the entry of the mixture. Optimum performance of the motor fed with hydrogen consists of a maximum power equal to 82% of that obtained with isooctane for a flammability limit (ϕ) of 1.1, a compressor rate (r) of 9, and a speed of 1800 rpm. To minimize nitrogen oxide emissions with hydrogen fuel, ϕ must either be under 0.6 or over 1.2. With poor mixtures, maximum powers of 1200 and 1800 rpm will only be reached when r is between 8 and 10, because power rapidly decreases once the maximum power is reached while nitrogen oxide concentration is maintained constant. With rich mixtures, and a ϕ of 1.2, r cannot exceed 8.5. Thus, it is impossible to optimize r to compensate for the loss of thermal output and power while trying to minimize nitrogen oxide concentrations. With methane fuel, optimum performance consists of a maximum power equal to 106% of that obtained with isooctane for a ϕ of 0.7 and an r of 13.4, at 1200 rpm. Only with rich mixtures can nitrogen oxide emissions be kept at a minimum while maintaining acceptable power and thermal output; with a ϕ of 1.1 and r of 13.5, nitrogen oxides will not exceed 1000 ppm. With poor mixtures, at the same nitrogen oxide concentration, thermal output will basically be the same, but power will be half as high.

59207

APTIC NO. 83317

Watson, Roger William, John Henry Udelhofen, and Joseph Stephan Strukl

REDUCING DEPOSITS AND SMOKE FROM JET FUELS. (*Standard Oil Co., Chicago, Ill.*) U. S. Pat. 3,891,401. 5p., June 24, 1975. 10 refs. (Appl. March 1, 1971, 4 claims).

A process of minimizing smoke and ash deposit formation in commercial and military jet engines and power plants is described. An additive comprising oil soluble salts of a transition metal, such as manganese or iron, and an alkaline earth metal is included in the fuel. A preferred additive consists of methylcyclopentadienyl manganese tricarbonyl and calcium alkylphenol sulfide in amounts to provide a Mn/Ca weight ratio of 5/1. The Ca salt may be in an alkaline form derived by over-basing with calcium oxide and carbon dioxide. There is no other additive that reduces both smoke and ash deposit formation. (Author abstract modified)

AIR POLLUTION ABSTRACTS, JUNE 1976

59208

APTIC NO. 76060

Weaver, Robert D., Laura Tietz, and Daniel Cubicciotti

DIRECT USE OF COAL IN A FUEL CELL: FEASIBILITY INVESTIGATION (FINAL REPORT). Stanford Research Inst., Menlo Park, Calif., Environmental Protection Agency Contract 68-02-1808, Proj. PYU-3547, Program Element 1AB013, ROAP 21BJV-024, Rept. EPA-650/2-75-040, 66p., June 1975. 15 refs.

NTIS: PB 245917/AS

The feasibility of using coal to produce electricity directly in a fuel cell that uses a molten-carbonate electrolyte, a coal anode, and an air cathode was investigated. The system utilizes coal in a nonpolluting fashion because the molten carbonate retains the pollutants from the coal. Electrodes made from charred coal yielded open circuit voltages close to 1 volt, and at 975 K the activation plus concentration polarization was about 200 millivolts at current densities of 100 milliamperes/sq cm and larger. Smaller polarizations were observed at higher temperatures. Current efficiencies were somewhat less than 100%. Carbon dioxide was the principal gaseous anode product; some carbon monoxide, which is the thermodynamically favored product, was also formed to a much lesser extent. Coal ash added to the molten electrolyte did not appear to be deleterious to cell operation. (Author abstract modified)

59209

APTIC NO. 76486

Weaving, J. H.

ROAD TRANSPORTATION. *Energy Dig.*, 4(4):7-11, Aug. 1975.

The design concepts of stratified charge engines that result in fuel economy and lower emissions are described. The stratified charge engine runs as far as possible at full throttle by means of the stratification of the gasoline/air mixture into rich and weak zones. This is done in either an open chamber or with a prechamber. This is similar to the direct injection and indirect injection diesel engines. The first large scale production unit is the Honda CVCC which is primarily designed for reducing emissions. The Volkswagen third generation engine consists of a stratified charge version of the standard air cooled 1.6 liter four cylinder opposed cylinder engine with an unscavenged prechamber with a double fuel injection system. This engine has a butterfly throttle up-stream of the inlet manifold fuel injector to modify the airflow for part loads in order to achieve improvements in hydrocarbon and carbon monoxide emissions.

59210

APTIC NO. 82168

Weidenbach, Gunter and Karl Hermann Koepernik

CATALYTIC REMOVAL OF CARBON MONOXIDE, UNBURNED HYDROCARBONS AND NITROGEN OXIDES FROM AUTOMOTIVE EXHAUST GAS. (*Kali-Chemie Aktiengesellschaft, Hannover, West Germany*) U. S. Pat. 3,895,093. 7p., July 15, 1975. 5 refs. (Appl. Jan. 31, 1974, 7 claims).

A process and a catalyst are disclosed for catalytically removing carbon monoxide, incompletely burned hydrocarbons, and nitrogen oxides from an automotive exhaust gas in a single stage catalytic converter. The ratio of fuel and air introduced to the engine is nearly stoichiometric. A catalyst is employed which is capable of promoting the simultaneous oxidative conversion of 90% of the carbon monoxide and hydrocarbons and reductive conversion of at least 90% of the nitrogen oxides. A preferred catalyst is one comprising a mixture of platinum, ruthenium, rhodium, and rhenium. The ratio of platinum, ruthenium, rhodium, and rhenium is preferably between about 1:1:1:1 and 1:0.25:0.25:0.25. Preferably, the ratio of exposed platinum atoms to total platinum atoms is between about 0.75:1 and 1:1. Suitable high temperature carriers are aluminum oxides and aluminum silicate which have been calcined at a temperature between about 800 and 1500 C prior to application of the metallic catalyst components. A process is also provided for the preparation of a suitable catalyst, comprising

CONTROL METHODS

59217

impregnating a high temperature resistant carrier with about 0.01 to 0.5% by weight of platinum, calcining the impregnated carrier between about 700 and 900 C, then impregnating, either separately or concurrently the carrier with from about 0.01 to 0.5% by weight each of ruthenium, rhodium, and rhenium and again calcining the catalyst at a temperature between about 700 and 900 C. (Author abstract modified)

59211

APTIC NO. 82835

Welty, Albert B. Jr. and Lindsay I. Griffin, Jr.

FLUE GAS DESULFURIZATION WITH AMMONIUM SULFITE-BISULFITE SOLUTION. (Exxon Research and Engineering Co., Linden, N. J.) U. S. Pat. 3,880,983. 9p., April 29, 1975. 4 refs. (Appl. Nov. 19, 1971, 7 claims).

A process for desulfurizing flue gas by absorption in an aqueous ammonium sulfite-ammonium bisulfite solution is described. Any ammonia which is picked up in the flue gas during desulfurization is removed by scrubbing the flue gas with wash water. Sulfur dioxide is recovered from the absorber effluent solution by acidifying a portion with ammonium bisulfate, crystallizing and decomposing the ammonium sulfate thus formed, and reacting the ammonia formed during decomposition with a second portion of the absorber effluent solution to form fresh ammonium sulfite-ammonium bisulfite solution. (Author abstract modified)

59212

APTIC NO. 76105

Wen, C. Y. and L. S. Fan

ABSORPTION OF SULFUR DIOXIDE IN SPRAY COLUMN AND TURBULENT CONTACTING ABSORBERS (FINAL REPORT). West Virginia Univ., Morgantown, Dept. of Chemical Engineering, Environmental Protection Agency Grant R-800781, Program Element IAB013, ROAP 21ACY-041, Rept. EPA-600/2-75-023, 114p., Aug. 1975, 68 refs.

NTIS: PB 247334/AS

Experimental data from both small- and large-scale turbulent contacting absorbers and spray columns used in the wet scrubbing of sulfur dioxide from flue gases were analyzed to obtain gas film mass transfer coefficients and overall coefficients in the liquid film. Recycled limestone, limestone-magnesium oxide, and lime scrubbing slurries were studied. The ratio of the gas and liquid film mass transfer resistances (or the fraction to which SO₂ removal is gas film controlled) increased with increasing slurry pH and magnesium concentration and with decreasing SO₂ partial pressure. Correlations for the gas film mass transfer coefficient and the ratio of mass transfer resistances predicted fairly accurately the experimentally observed SO₂ removal efficiencies.

59213

APTIC NO. 83208

Wenner, John G.

SULFUR OXIDES REMOVAL SYSTEM. (Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,883,326. 6p., May 13, 1975. 1 ref. (Appl. Dec. 17, 1973, 2 claims).

A method for continuously removing sulfur oxides from a waste gas stream is described. A continuous rotating bed system obviates the need of a swing bed operation to effect periodic regeneration of sulfur dioxide absorbing material. This eliminates the problems of material handling and material attrition common in other systems. In this system, two stages of rotating beds are utilized and rotated from a common axial power source. A first contacted rotating unit serves as a heat exchanger zone to regulate the temperature of the flue gas stream passing along to a second stage sulfur oxides removal zone. (Author abstract modified)

59214

APTIC NO. 82535

Werner, Peter, Ulrich Drews, Norbert Rittmannsberger, Wolfgang Busse, Helmut Moder, and Karl-Heinz Ohr

FUEL INJECTION ARRANGEMENT CONTROLLED IN DEPENDENCE UPON THE AIR INFLOW RATE. (Robert Bosch G.m.b.H., Stuttgart (Federal Republic of Germany)) U. S. Pat. 3,898,964. 23p., Aug. 12, 1975. 7 refs. (Appl. Sept. 21, 1973, 53 claims).

A fuel injection arrangement for an internal combustion engine was developed which includes electronic control circuitry particularly designed for realization in integrated circuit form. This arrangement is more versatile than other systems. The system contains at least one engine cylinder, an air intake passage communicating with the interior of the cylinder, a piston movable in the cylinder, and an engine crankshaft connected to the piston. The system includes an electrically actuable fuel injection valve having an electrical input for receipt of a valve opening pulse and is operative for injecting fuel into the cylinder for a time interval corresponding to the duration of the valve opening pulse. Also included in the system are a triggering unit, an airflow sensing unit, a first pulse generating unit, a second pulse generating unit, and a composite valve opening pulse. (Author abstract modified)

59215

APTIC NO. 82898

Wessel, Wolf and Johannes Brettschneider

EXHAUST GAS COMPOSITION CONTROL SYSTEM FOR INTERNAL COMBUSTION ENGINES, AND CONTROL METHOD. (Robert Bosch GmbH, Stuttgart (Federal Republic of Germany)) U. S. Pat. 3,875,907. 8p., April 8, 1975. 8 refs. (Appl. Sept. 20, 1973, 14 claims).

An integral controller is used which controls the relative proportion of mass of air and fuel applied to the engine. The exhaust gas composition is sensed by a sensor which provides an electrical output signal which is applied to the integral controller. It controls the mixing device which mixes air and fuel to provide the air/fuel mixture for the engine in proper proportion for minimum noxious exhaust emission. The integral controller integrates at a rate which is controlled by the speed of the engine. A speed dependent pulse signal is derived, applied to a monostable multivibrator which samples the signal so that the controller integrates only when it receives the signal and holds the signal until the next sampled signal is applied. In known devices before any change in the air/fuel mixture is sensed by the sensor, four strokes of the engine must elapse before the sensor can sense a change in the composition of the exhaust gases. A high speeds of the engine, the controller reacts too slowly and the desired command value is reached only slowly. (Author abstract modified)

59216

APTIC NO. 81986

Westlin, Karl L.

HIGH EFFICIENCY UNIT FILTER. (American Air Filter Co., Inc., Louisville, Ky.) U. S. Pat. 3,914,116. 4p., Oct. 21, 1975. 13 refs. (Appl. Oct. 24, 1973, 1 claim).

A high efficiency unit filter assembly which is capable of withstanding greater vibrational and shock conditions than prior art designs is described. The filter core consists of pleated filter material which is formed of a strip of filter medium folded upon itself at longitudinally spaced intervals. The core is separated by corrugated spacer members extending into the pleats between the flanks thereof from opposite sides of the filter. The spacer member edges are spaced from the pleat fold turns a distance equal to at least one-half of the overall height of the spacer members. The members are secured to the adjacent filter medium by continuous one piece beads of adhesive extending across the face of the filter core. (Author abstract modified)

59217

APTIC NO. 76514

Wheeler, R. N., Jr. and M. E. Sutherland

CONTROL OF IN-TRANSIT VCM. Chem. Eng. Progr., 71(9):48-53, Sept. 1975.

Methods of controlling in-transit vinyl chloride monomer (VCM) are discussed. The occupational standard is set at a limit of 1 ppm by volume for workers by the Occupational Safety and Health Administration (OSHA). This and other anticipated governmental safety regulations require changes in distribution equipment and operations to control VCM emissions. Gauging devices that permit no product emission must be installed on tank cars, tank trucks, and barge tanks. Various ventilation hoods and sight flow indicators are used in loading and unloading operations. Tank car size is limited to 25,500 gal for all new cars in vinyl chloride service. The car must be insulated or have steel safety shields on the ends to reduce the possibility of tank punctures in derailments. Pipelines offer the ultimate potential reduction in emissions for VCM distribution, but pipelines carrying suspected carcinogens are subject to different rules. Above ground pipelines can be properly labeled and monitored regularly for leaks.

59218

APTIC NO. 81750

Wilkins, Wayne Eldo

QUICK-CLEAN VENT FILTER. (Assignee not given.) U. S. Pat. 3,912,473. 3p., Oct. 14, 1975. 8 refs. (Appl. May 21, 1973, 3 claims).

A filter unit for use with vent and exhaust type fan assemblies is described which prevents the build-up of dirt and grease particles and has replaceable filter pads. The device consists of a filter housing ring having an outwardly extending annular flange at one end and an inwardly extending annular flange at the other end. The circular housing contains replaceable filter pads. Permanent magnets are attached to the housing for easy installation of the filter unit over a fan grill opening.

59219

APTIC NO. 82721

Williams, John S. and Suresh C. Garg

SOLID WASTE HANDLING AND DISPOSAL AT NAVAL SHORE FACILITIES - AIR CURTAIN DESTRUCTOR EXPERIMENT (FINAL REPORT). Naval Construction Battalion Center, Port Hueneme, Calif., Civil Engineering Lab., Program Element 63721N, Y41-21, Y41-21.006.01.001A, Rept. TN-1398, 28p., July 1975. 7 refs.

Field tests to assess the effectiveness of an air curtain for minimizing particulate emissions from open pit incinerators used for solid waste disposal were conducted. Changes in the pit configuration and modifications of the blower nozzle were made during the test period, and some reduction in particulate emissions was achieved through the installation of a curved deflector plate at the top of the pit wall. However, the observed smoke emissions exceeded the local air pollution control regulations during all of the tests. Thus, open pit incinerators are recommended for use only in areas where disposal of large amounts on untreated lumber is required and only where other methods of disposal are not available.

59220

APTIC NO. 83138

Winterhalter, Johannes

ANNUAL SURVEY ON ENVIRONMENTAL PROTECTION (II). (Jahresuebersicht Umweltschutz (2. Folge)). Text in German. Giesserei (Duesseldorf), 62(22):586-591, 1975. 46 refs.

An annual review on prevention or reduction of pollution from foundries was presented. High noise levels at the place of work call for the use of noise-free machinery and processes and noise protection measures, wherever necessary, to prevent damage to hearing. For the separation and removal of odorous substances from foundries, washing separators using oxidants with chemical absorption were suggested. An alternate solution was ground filtration with soil or peat layers adsorbing and degrading odor-producing substances. Contamination of drinking water could be reduced or eliminated by adsorbing impurities to soil particles, chemical conversion, or biological decomposition. The toxicity of sewage could be determined by a sim-

AIR POLLUTION ABSTRACTS, JUNE 1976

ple inhibition test (Jacobs, Schweisfurth). Foundry sludges and dusts can be dehydrated by the methods applied of Moergeli and Lerch. Free phenol decomposition in used foundry sands was observed in which phenol in seeping water decreased from 20 mg/l to 0 within 55 days. Foundry/sands can be used as landfills outside of water-protection zones. A waste material catalogue was reviewed for foundries which listed most waste according to composition and origin, but did not indicate how to remove them. The most frequent residues from foundries were enumerated as wastes of mineral origin. Safety measures undertaken in large-scale deposition of dangerous wastes were described.

59221

APTIC NO. 82005

Witt, Kenneth C.

TURBO-SUPERCHARGER EXHAUST. (Clark Equipment Co., Buchanan, Mich.) U. S. Pat. 3,908,368. 4p., Sept. 30, 1975. 11 refs. (Appl. May 6, 1974, 1 claim).

A stress-free exhaust construction for a turbosupercharger on an engine has an adjacent wall through which exhaust gases are discharged. A rigid conduit member is connected to and extends away from the supercharger. A second rigid conduit member in alignment with the first conduit extends through the wall. There are cooperating baffles at the adjacent ends of the two conduit members which provide a nonrigid connection between the two conduit members and a tortuous passage for gases between the inside and the outside of the connection. A flow of air over the outer terminus of the connection tends to force air into the tortuous passage toward the inside of the connection. The invention decreases the amount of exhaust gases discharged through the connection instead of out through the end of the exhaust pipe. (Author abstract modified)

59222

APTIC NO. 79732

Wixson, Bobby G. and J. Charles Jennett

THE NEW LEAD BELT IN THE FORESTED OZARKS OF MISSOURI. *Environ. Sci. Technol.*, 9(13):1128-1133, Dec. 1975.

The environmental impact of the new lead belt in the forested Ozarks of Missouri is described and control methods are discussed. Rapid industrial development in the sparsely populated, rural forest region causes various forms of lead, copper, zinc, cadmium, and other trace metals to be released into a formerly pristine ecosystem. Studies have been made of the ARASCO and AMAX lead smelters. Sources of trace metals in the environment are associated with the mining milling operations and the smelter refinery process. A high efficiency mist eliminator and additional cooling equipment were installed to the acid plant for increased acid production, improved sulfur recoveries, and reduced sulfur dioxide emissions. Four permanent SO₂ ambient monitoring stations were installed. Whenever the SO₂ ambient level at any station exceeds the Missouri 1-hour ambient standard (0.25 ppm) for more than 10 min, the sinter acid plant is shut down. Improved baghouse maintenance and operation were developed and a well qualified, full time, inhouse, environmental group monitors operations and works with agencies and researchers on effective pollution control procedures.

59223

APTIC NO. 82235

Woebecke, Herman N. and Robert J. Gartside

HIGH PRESSURE CRACKING FURNACE AND SYSTEM. (Stone and Webster Engineering Corp., Boston, Mass.) U. S. Pat. 3,910,768. 8p., Oct. 7, 1975. 3 refs. (Appl. Nov. 6, 1973, 8 claims).

A high pressure furnace for cracking hydrocarbons to produce olefins and system for maximizing the thermal energy recovered from high pressure flue gases issuing from the furnace are described. Long flame burners produce combustion gases to circulate through radiant and convection sections in a furnace under pressure to crack hydrocarbons. The cracked gas quencher formed with the furnace is configured annularly

CONTROL METHODS

59230

to receive the process tubes which are essentially a continuance of the tubes in the radiant section. Flue gas which has been cooled serves as the coolant for the cracked gases in the quencher. The flue gases are used to generate high pressure steam, elevate the temperature of the hydrocarbon steam mixture to be processed, and are also used in a turbine-compressor assembly. A portion of the flue gases are returned to the furnace through the burners after issuance from the quencher. (Author abstract modified)

59224

APTIC NO. 80509

Woelke, M.

CATALYTIC AND THERMAL AFTERBURNING OF POLLUTANTS IN OFF GASES. (*Katalytische und thermische Nachverbrennung von Schadstoffen in Abgasen*). Text in German. *Technik (Berlin)*, 30(8): 529-530, 1975.

General technical and economic aspects of thermal and catalytic waste gas incineration are discussed. Waste gas incineration can be considered when the recovery of valuable waste gas components is impossible, and when other exhaust control methods are not more efficient. Thermal and catalytic afterburning is most important in the destruction of hydrocarbon emissions in the petroleum refining industry, of organic substances generated in organic syntheses, in lacquering, printing, pharmaceutical plants, foundries, and small metallurgical plants. It is of great importance for the food industry and livestock farming where it is used for the destruction of malodorous emissions. Catalytic incineration, requiring temperatures between 180 and 500 C, is preferable to thermal incineration whenever the waste gases to be destroyed do not poison the catalyst. Waste heat utilization, especially after thermal incinerators, is of great economic importance.

59225

APTIC NO. 82265

Wolfe, Russell C.

DUST COLLECTOR APPARATUS. (*Dixie Mfg. Co., Baltimore, Md.*) U. S. Pat. 3,894,854. 9p., July 15, 1975. 10 refs. (Appl. Nov. 27, 1973, 17 claims).

A two-stage dust collection air pollution control system is described. The collector has a cyclone stage and a tube filter stage that is designed to handle both heavy particles and fine dust in removing contaminants from the atmosphere in manufacturing processes in factories and buildings. The apparatus works on a reverse air flow principle which operates at a constant low pressure air drop to insure adequate suction in the exhaust system at all times. Internal air pressure in the filter tubes, rather than external pressure, eliminates the need for metal supports for the filter tubes, resulting in a simple installation and long service life.

59226

APTIC NO. 80031

Wong, S. L.

ENERGY SAVED THROUGH HEAT-TRANSFER METHODS. *Oil Gas J.*, 73(44):49-52, Nov. 3, 1975. 7 refs.

An analytical approach to energy saving through the design of heat transfer equipment is presented. Opportunities by the heat-transfer engineer to save energy in process plants and refineries include: waste heat recovery—designing for the optimum hot fluid outlet temperature with respect to the maximum economical heat recovery; optimizing process heat exchangers—selecting the most economical temperature approach, type, and heat transfer characteristics; cooling water balance; and minimizing the excess air in fired heaters. A savings of 2% of fuel can be achieved by lowering excess air by 5%.

59227

APTIC NO. 84097

Wuehbenhorst, Heinz

POSSIBILITIES FOR THE REMOVAL OF ORGANIC SUBSTANCES FROM THE WASTE AIR OF FOUNDRIES. (*Moeglichkeiten zur Beseitigung organischer*

Stoffe in der Abluft von Giessereien). Text in German. *Giesserei (Duesseldorf)*, 62(25):658-661, 1975. 16 refs.

A survey of the technological and economic problems involved in active and economically significant waste disposal for waste gas of foundries is discussed. There are various possibilities for oxidative degradation of organic components in chemical industries and continuously working plants by combustion and in gas scrubbers. Combustion techniques include open burning, catalysis, and activated carbon. Potassium permanganate, ozone, and biological wet cleaners figure among gas scrubbing methods. Unfortunately, there are insufficient data on construction and operation costs.

59228

APTIC NO. 82306

Wuensch, Heinz

APPARATUS FOR FACILITATING THE WITHDRAWAL OF GASES FROM A GAS FILLED CHAMBER SUCH AS A COKE OVEN. (*Firma Carl Stoll (Germany)*) U. S. Pat. 3,890,206. 4p., June 17, 1975. 5 refs. (Appl. March 8, 1974, 8 claims).

An apparatus for facilitating the withdrawal of gases from coke ovens into receivers is described which provides for varying the withdrawal pressure necessary for the gas to be efficiently removed. The device consists of a conduit with a riser portion, an inlet connected to the top of the coke oven, and a discharge end connected to a receiving tank. The conduit includes a bend between the discharge and riser and contains a pivotal nozzle that may be easily adjusted to an optimum angular position to effect the maximum efficiency for withdrawing the coke oven gases.

59229

APTIC NO. 73540

Wyczalek, F. A., J. L. Harned, S. Maksymiuk, and J. R. Blevins

EFI PRECHAMBER TORCH IGNITION OF LEAN MIXTURES. Preprint, Society of Automotive Engineers, Warrendale, Pa., 16p., 1975. 15 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750351.)

A prechamber-type torch ignition system on a modified four-cylinder 140 cu in. internal combustion engine is described in terms of its design and the effects of engine operating variables on exhaust emissions. The prechamber consists of a blind cavity coupled to the main chamber with an orifice. Fuel is supplied to the prechamber with an electronic fuel injector, and the mixture is ignited by a spark plug. The prechamber produces an ignition torch which ignites a main chamber that is supplied with a lean mixture carbureted in the conventional manner. Vehicle operation (3000 lb inertia weight) is acceptable at air/fuel ratios up to 22:1; and hydrocarbon, carbon monoxide, and nitrogen oxide emissions at this air/fuel ratio are 3.8, 4.0, and 1.8 g/mi. Although the torch ignition jet concept results in combustion of extremely lean mixtures, the latter also result in very low exhaust temperatures which present a major problem for hydrocarbon cleanup devices.

59230

APTIC NO. 76265

Yada, Y.

FILTER ADSORPTION OF PLASTICIZER FUMES BY MULTI-LAYER FILTER MODEL ES. (*Fukuso firuta ES gata ni yoru kasoza fumu no roka kyuchaku*). Text in Japanese. *Enbi to Porima (Polyvinyl Chloride Polym.)*, 15(8):21-23, Aug. 1975.

The working environment of a soft polyvinyl chloride fabrication plant is polluted by a large amount of plasticizers scattered by the heat applied during processing; a serious health hazard. A multi-layer filter (Model ES) designed for the removal of plasticizer fumes and stabilizers by filtration and adsorption was developed. The effective collection of plasticizer fumes largely depends on the efficiency of the hood, and design specifications of various types of hood and

standard multi-layer filters are given with data on the filtration resistance and the odor intensity dilution effect. For example, the DOP fume concentration can be reduced from 0.15 g/cu m before treatment to 1 mg/cu m by the use of Model ES, and the odor intensity is also reduced on the order of a dilution factor of 100. The removing efficiency for plasticizer fume is designed to be above 98%.

59231

APTIC NO. 83491

Yagi, Shizuo, Kiyoshi Miyaki, and Yasuhiro Sato

COMBUSTION CHAMBER OF INTERNAL COMBUSTION ENGINE. (Nainen kikan no nenshoshitsu sochi). Text in Japanese. (Honda Motor Co., Ltd. (Japan)) Japan. Pat. Sho 50-38766. 4p., Dec. 12, 1975. (Appl. Feb. 14, 1973, 1 claim).

An improved combustion chamber of an internal combustion engine, which operates with a dilute air/fuel mixture and prevents emission of carbon monoxide and nitrogen oxides during all operational modes is described. The process consists of primary and secondary combustion chambers, primary and secondary carburetors, synchronized primary and secondary intake valves, a load indicator connected to the secondary intake valve, a spark plug installed in the secondary combustion chamber, an air passage between the primary and secondary combustion chambers, and a control system for the opening of the air passage. When the engine starts, the primary and secondary intake valve are opened, which causes an inflow of the dilute air/fuel mixture from the primary carburetor to the primary combustion chamber and an inflow of concentrated air/fuel mixture from the secondary carburetor to the secondary combustion chamber. Then the concentrated air/fuel mixture is ignited by the spark plug, and the flames discharged through the air passage to the primary combustion chamber and combust the dilute mixture. When the load is low the opening of the air passage is widened, and when the load is high it is narrowed.

59232

APTIC NO. 80088

Yajima, Masaaki and Soichi Niwa

HITACHI VCM MONITORING SYSTEM. (Hitachi VCM monitoringu sisutemu). Text in Japanese. Enbi to Porima (Polyvinyl Chloride Polym.), 15(8):7, Aug. 1975.

The monitoring system for vinyl chloride monomer developed by the Hitachi Manufacturing Co. is described. The system consists of a sampling, analyzer, programmer-recorder, and alarm units. Up to 24 different sampling sites can be monitored. The sample air is filtered before entering the analyzer (gas chromatography with hydrogen flame ionization detector). Vinyl chloride monomer concentrations ranging from 0 to 1000 ppm can be determined with a precision of 0.04 ppm. The analysis time for a single sample is 5 minutes, although higher speed analysis is possible. An average-time-analysis, such as a 10 minute average, is also possible. The VCM concentration can be recorded in the form of a chromatogram, a histogram, or an intermittent plotting. An alarm unit to warn of high VCM levels at individual sampling spots is available.

59233

APTIC NO. 83828

Yamada, Hiroshi

TREND OF DUST COLLECTING TECHNOLOGY AND PROBLEMS. (1) IMPROVEMENT OF ELECTRIC DUST COLLECTOR. (Shujin gijutsu no doko to mondaiten. (1). Denki Shujin Sochi no Kairyo). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(12):58-59, Dec. 1975.

The improvement in electric dust collectors investigated and developed by the Hitachi Plant Construction Co., is described. The increasing need for highly efficient dust collectors has brought about an improvement in electrode structure and control of the electric power source. Frame type dust collectors of large capacity were developed recently, typical of which is an electric dust collector of large capacity for a power plant boiler (600-1000 MW), which has an electrode length of 10 to

12 m, a gas flow distributing plate to allow steady uniform gas flow, and inlet-outlet dampers to prevent dust from scattering. The high dust collecting efficiency corresponds to the high electric voltage, therefore a conventional selenium rectifier was improved to a silicon rectifier. The performance of the electric collector is affected by conditions of dust and gas, and additives are often used to stabilize dust and gas. For example, sulfur trioxide, water, and ammonia are added to prevent dust interference, and ammonia is added to neutralize sulfur trioxide.

59234

APTIC NO. 82052

Yamada, Kiichi

APPARATUS FOR REMOVING NOXIOUS SUBSTANCES FROM CHIMNEY EXHAUST GAS. (Assignee not given.) U. S. Pat. 3,910,766. 7p., Oct. 7, 1975. 5 refs. (Appl. April 24, 1973, 5 claims).

An apparatus for removing noxious substances from chimney exhaust gas is described. Dust particles, carbon monoxide, nitrogen oxides, and sulfurous acid gas are removed from exhaust gas at factory chimneys, such as iron works, steel works, electric power plants, and oil refineries. None of the conventionally proposed methods and devices for preventing air pollution from industrial plants is satisfactory for practical applications. In this device, a first filtering chamber is used which collects dust particles by using a sticky dust remover. A second filtering chamber separates sulfurous acid gas and NOx by caustic soda, and a third filter chamber removes any residual pollutants in the exhaust gas. (Author abstract modified)

59235

APTIC NO. 83819

Yamada, T. and I. Hanamizu

ON THE STACK GAS DESULFURIZATION FACILITY OF MIZUSHIMA 4TH SINTERING PLANT. (Mizushima dai-4 shoketsu kojo haiei datsuryu setsubi ni tsuite). Text in Japanese. Tetsu to Hagane (Iron Steel), 61(12):68, Sept. 1975.

The flue gas desulfurization facility installed at the Mizushima 4th sintering plant is described. Desulfurization was by a wet process lime gypsum method. The desulfurization facility has a maximum gas treating capacity of 750,000 n cu m/hr, and is intended to treat half of the gas emitted from the plant. Since the sulfur dioxide concentration emitted from the various window boxes of the sintering equipment was different, the desulfurization was done only for the flue gas emitted from those boxes with higher SO₂ concentrations. In all, 90% of the SO₂ in the total flue gas emission was treated by this method. The desulfurization efficiency obtained was more than 95%. From 40 to 60% of the dust component of the flue gas could be also removed by the desulfurization facility. The purity of the gypsum produced was 98%, but it had a rather small particle size.

59236

APTIC NO. 76503

Yamagishi, Kazuo, Masahiro Horikawa, and Yasuo Kakegawa
FUEL-BURNING EQUIPMENT EMITTING LOW NITROGEN OXIDES. (Chisso sankabutsu tei-hassei nensho sochi). Text in Japanese. (Tokyo Gas Co., Ltd., Tokyo (Japan)) Japan. Model Util. Sho 50-28407. 2p., Aug. 22, 1975. 1 ref. (Appl. Dec. 26, 1970, claims not given.)

A method of reducing the nitrogen oxides concentration in combustion waste gases is described. It can be applied to furnaces, boilers, and dryers. A part of the combustion gas from a combustion chamber is recirculated to the burner nozzle through a recirculation duct. The recirculation is made to either the fuel line or the air line. In the former case, the recirculation duct is connected to the venturi tube of the fuel line, and the recirculation is promoted by the utilization of a blower. The combustion temperature at the burner nozzle can be lowered by mixing a part of the waste gas, therefore reducing the formation of NOx in the combustion chamber.

59237

APTIC NO. 81757

Yamagishi, Kazuo, Masaaki Nozawa, and Tsunenori Tokumoto

COMBUSTION METHOD FOR HYDROCARBONIC FUELS WITH LOW EMISSION OF NITROGEN OXIDES. (Tokyo Gas Co., Ltd., Tokyo (Japan)) U. S. Pat. 3,914,091. 4p., Oct. 21, 1975. 5 refs. (Appl. Feb. 28, 1974, 2 claims).

A combustion method that results in low nitrogen oxide emissions and avoids the difficulties associated with conventional staged combustion methods is described. Hydrocarbon fuel is mixed with air in an amount less than 70% of the theoretically required amount for complete combustion and is subjected to a primary combustion step. The partial combustion is then accelerated, resulting in the appearance of hydrogen and carbon monoxide as decomposition products. These gases are led across heat absorbing processes to a combustion chamber for the completion of the combustion process. (Author abstract modified)

59238

APTIC NO. 83764

Yamamoto, Kyoko and Osamu Sekido

DESULFURIZATION OF DISCHARGED GASES. (Haigasū no datsuryūho). Text in Japanese. (Agency of Science and Technology (Japan)) Japan. Pat. Sho 50-11339. 5p., April 30, 1975. 1 ref. (Appl. July 19, 1967, 1 claim).

A method of flue gas desulfurization by oxidation of the sulfur compounds to sulfur trioxide with an oxidation catalyst and the adsorption of SO₃ by contact with a carbonaceous adsorbent at a temperature between 360 C and the dew point of SO₃ is described. The dew point of SO₃ is the temperature at which liquid sulfuric acid is formed by the co-condensation of water and SO₃. The oxidation of SO₂ to SO₃ is by the use of conventional catalysts such as V₂O₅ at 350-450 C. Cocoa nut charcoal can be used for adsorption. After adsorption, the adsorbent is easily regenerated by heating above 400 C or by washing with water. The basic principle of the present invention lies in the elimination of the slow rate-determining process of SO₂ adsorption on charcoal. The adsorption takes place in 4 steps; the diffusion of SO₂ and O₂ onto the surface of activated carbon, adsorption formation of SO₃, and the diffusion of this SO₃ into micropores. Of these, the formation of SO₃ is the slowest. Therefore, preoxidation of SO₂ in discharged gases speeds the rate of adsorption of SO₂.

59239

APTIC NO. 80075

Yamamoto, T.

DUST CONTROL TECHNIQUE FOR NATURAL GRAPHITE REFINING AND PULVERIZING OPERATION. (Tennen kokuen funmatsu seizogyō no funjin taisaku gijutsu). Text in Japanese. Seramikusū (Ceramics), 10(9):663-666, Sept. 1975.

Three bag filters are used for dust collection at the interim pulverizing and refining process where eleven ball mills (4-6 tons) are used. The bag filters each have a capacity of 3000 cu m/hr. The dust concentration at this process was reduced from 1.68 mg/cu m in 1967 to 0.076 mg/cu m in 1974. The exhaust gases from two high-capacity, rotary dryers are passed through a double cyclone where particles larger than 5 micron are removed. The resulting gas is led through a venturi scrubber where the small particles are removed. The dust concentration in the waste gas is reduced to as low as 0.03 g/N cu m. The graphite particles from an automatic, closed-system grinder are collected by bag filters and are transferred by air to a cyclone where they are separated. The air is recycled and the dust collection performed in a closed system.

59240

APTIC NO. 76304

Yamauchi, Teruo, Norishige Ohyama, Torazo Nishinomiya, and Yukio Hosho

EXPERIMENTAL STUDIES ON THE LEAN THERMAL REACTOR. (Rin samaru riakuta no jikkenteki kento).

Text in Japanese. Preprint, the Japan Society of Mechanical Engineers, Tokyo, p. 279-282, 1975. 2 refs. (Presented at the Japan Society of Mechanical Engineers, Lecture Meeting, Sendai, Japan, Oct. 11-12, 1975.)

Lean thermal reactors were installed on three 4-cycle, 4-cylinder engines and their performances were tested. The capacities of the thermal reactors ranged from 1.6 liter to 4.5 liter; heating plates heated by the exhaust gas were attached to the reactors to enlarge the stable region of the lean gas mixture. Hydrocarbon and carbon monoxide concentrations were remarkably reduced when the reactor was insulated. The sum of hydrocarbon and carbon monoxide remained almost unchanged when the temperature of the exhaust gas was maintained at 550-650 C. The HC concentration decreased with increasing exhaust gas temperature above 550 C. The oxidation reaction of CO was significantly promoted at temperatures higher than 650 C. The HC + CO concentration could also be reduced by reducing the volume of the reactor.

59241

APTIC NO. 83265

Yanagisawa, Kazuto

LIQUEFIED GAS CARBURETOR OF INTERNAL COMBUSTION ENGINE. (Nainen-kikanyō ekika gasu kikaki). Text in Japanese. (Nippon Kikaki Seisakusho (Japan)) Japan. Model Util. Sho 50-36098. 2p., Oct. 21, 1975. (Appl. Feb. 24, 1971, claims not given).

An improved liquefied gas carburetor for internal combustion engines in automobiles is described. Conventional carburetors use only one venturi which works for all ranges of operational speeds and the diameter of the venturi is enlarged to improve the power of the engine. However, this design configuration results in various problems during low speed operation of the vehicle. The main features of the new process are: a liquefied gas control, a low speed fuel supply tube, a primary fuel supply tube, an open/shut valve for the low speed fuel supply tube, and a throttle valve. During idling when the throttle valve is closed or almost closed, the open/shut valve is fully open, and during shifting to a higher speed, the open/shut valve gradually closes responding to the opening of the throttle valve. In this manner, a carburetor with a venturi with an enlarged diameter for more power during high speed operation can also be provided with adequate fuel at low engine speed, which solves the problems related to a low speed operation.

59242

APTIC NO. 82007

Yannone, Robert A. and James J. Shields

SYSTEM AND METHOD FOR OPERATING A GAS TURBINE ELECTRIC POWER PLANT WITH BYPASS FLOW FUELING OPERATION TO PROVIDE IMPROVED RELIABILITY AND EXTENDED APPARATUS LIFE. (Westinghouse Electric Corp., Pittsburgh, Pa.) U. S. Pat. 3,913,314. 29p., Oct. 21, 1975. 6 refs. (Appl. June 9, 1972, 34 claims).

An electric power plant with an industrial gas turbine for drive power, operated by a computer control system, is described. The gas turbine is provided with a liquid fuel system permitting operation of the turbine on one or more fuels. The fuel system has a turbine driven pump which supplies fuel to turbine nozzles through a throttle valve. A bypass pump pressure regulator valve and a bypass pressure temperature limiter valve function together to provide stable fuel pressure operation and stable turbine inlet air temperature operation during ignition and other turbine operating periods. The bypass means are operated substantially independently of the control system. (Author abstract modified)

59243

APTIC NO. 82303

Yannone, Robert A. and Roy W. Kiscaden

DIGITAL COMPUTER CONTROL SYSTEM AND METHOD FOR MONITORING AND CONTROLLING OPERATION OF INDUSTRIAL GAS TURBINE APPARATUS TO DRIVE SIMULTANEOUSLY AN ELEC-

TRIC POWER PLANT GENERATOR AND PROVIDE EXHAUST GASES TO AN INDUSTRIAL PROCESS. (Westinghouse Electric Corp., Pittsburgh, Pa.) U. S. Pat. 3,891,915. 47p., June 24, 1975. 8 refs. (Appl. Jan. 15, 1973, 23 claims).

A computerized system for controlling the operation of industrial gas turbines used for generating electrical power and for providing exhaust gases to industrial processes is described. The system achieves constant exhaust temperature and provides greater flexibility of control than prior art designs. The system employs a programmed digital computer in a hybrid control system arrangement to provide for load and loading rate control over the turbine and generator or other load unit. Speed, surge, and temperature limit control with non-linear control loop characterization are also provided. The computer also controls the supply of exhaust gases, preferably at a constant temperature, to other processes. Exhaust temperature control is achieved under load by air flow modulating means which are movably mounted at the intake of the compressor and are positioned in response to computer determined control directives.

59244

APTIC NO. 82509

Yashuev, G. K.

RECOVERY OF PHENOL-CONTAINING VAPORS FROM INSTALLATIONS FOR THE SELECTIVE PURIFICATION OF OILS. (Uslavlivanie fenolsoderzhashchikh parvo iz emkostey ustanovok selektivnoy ochistki masel). Text in Russian. Neftepererab. Neftekhim., no. 9:42, 1975.

Phenol vapors generated during the selective purification of oils in a petrochemical plant are exhausted by means of an ejector into an absorber, after which phenol is extracted in another absorber. This process has resulted in a complete elimination of malodorous phenol emission to the atmosphere.

59245

APTIC NO. 82412

Yeakey, Ernest Leon and Philip Hotchkiss Moss

METHOD OF PURIFYING GASES CONTAINING ACID IMPURITIES USING STABILIZED 2-(2-AMINOETHOXY) ETHANOL. (Jefferson Chemical Co., Inc., Houston, Tex.) U. S. Pat. 3,891,742. 4p., June 24, 1975. 2 refs. (Appl. April 10, 1974, 6 claims).

An improved 2-(2-aminoethoxy) ethanol composition was developed for purifying gases containing acid gas impurities, such as natural gas. The compound has improved resistance against decomposition and/or degradation in the presence of the acid gases because it is stabilized by incorporating into it a water soluble trialkanolamine. There is no known prior art for preventing or retarding the degradation of 2-(2-aminoethoxy) ethanol to bis-2-hydroxyethoxyethyl urea when the composition is used to sweeten natural gas. (Author abstract modified)

59246

APTIC NO. 83123

Yie, Gene G., S. J. Cunningham, and Robert E. Rosenberg

IRRIGATION ENGINE EXHAUST CONVERSION TO OBTAIN FERTILIZING SOLUTION. (Inst. of Gas Tech., Chicago, Ill. and Southern California Gas Co., Los Angeles, Calif.) U. S. Pat. 3,888,652. 5p., June 10, 1975. 8 refs. (Appl. May 29, 1973, 8 claims).

An anti-air pollution method and apparatus for fertilizing crop areas are described. Aqueous ammonia solutions are dispensed from irrigation engines by utilizing the body of water which moves through the engine driven pumps. The ammonia is formed in place by catalytically converting nitrogen oxide emissions present in the engine exhaust. The ammonia is dissolved in the body of water which moves through the irrigation pump driven by the engine. (Author abstract modified)

192

AIR POLLUTION ABSTRACTS, JUNE 1976

59247

APTIC NO. 80344

Yokoyama, Mikio

DUST COLLECTING EQUIPMENT. (Shujin sochi). Text in Japanese. (Yokoyama, Mikio (Japan)) Japan. Model Util. Sho 50-36749. 6p., Oct. 25, 1975. (Appl. July 28, 1971).

The process described relates to an efficient dust collecting machine which cleans air or gas by separating and collecting airborne dust and powdered granules. The design features of this improved wet type dust collector consist of a high speed (1000-2000 rpm) rotating drum with a saw toothed surface; a box-shaped water sealed main body which contains water at its lower level; a curved baffle plate installed 5-30mm away from the outer circumference of the drum for directing the flow of the water film; a horizontal plate installed 15-40mm below the water surface and connecting to the baffle plate; an indented curved surface to direct the flow of the air/gas and water mixture; a guiding plate which is installed underwater except for 40mm at the top end which directs the flow further up along the passage between the inclined walls with the curved top directing downward; a blower and a filter with a sludge stripping process installed at the air/gas outlet; and a screw conveyor in the tube casing installed in the gutter at the bottom of the main body for the transportation of collected dust. This dust collector efficiently mixes air/gas and water, and effectively wets and collects dust floating on the water surface or deposited at the bottom while dustless dehydrated air/gas is safely released to the outside.

59248

APTIC NO. 82097

Yoshida, Akira

FUEL ADDITIVE AGENT SUPPLYING DEVICE FOR INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,914,995. 5p., Oct. 28, 1975. 4 refs. (Appl. June 5, 1974, 3 claims).

A device for supplying a fuel additive agent such as methyl alcohol to the internal combustion engine of an automobile for power increase and fuel economy is described. Air flowing to a fuel additive feed device passes through a filter and then through a throttling valve and a flowmeter comprising an upright transparent tube with a downwardly tapering interior. A floater in the tube rises to a level dependent upon the rate of air flow through it. Air feed can be kept to a level dependent upon the rate of air flow through it. Air feed can be kept at a predetermined rate by adjustment of the throttling valve and inability to attain that rate with the throttle valve fully open signifies excessive plugging of the filter. No other installation has a means to observe and regulate the air volume entering the air intake tube connected to an additive agent vessel. (Author abstract modified)

59249

APTIC NO. 84683

Yoshida, Eiichi

TREND OF ENGINE FUELS. (Engine nenryo no doko). Text in Japanese. Preprint, Fuel Society of Japan, Combustion Section, p. 54-63, 1975. 18 refs. (Presented at the Combustion Method of New Engines Seminar, Tokyo, Japan, June 9-10, 1975.)

Trends of supply and demand of automobile fuels, present processes of gasoline production, removal of lead from gasoline, the quality of gasoline, the composition of gasoline, and light oils for diesel engines are discussed. The elimination of Pb from gasoline is important because of the poisonous effect of lead on human health, and also its effect on catalytic gas cleaners for automobile exhaust gases. The addition of tetraethyl lead increased up to 1969 when the lead content reached 0.70 ml/l. After 1970, however, a level of 0.25 ml/l has been maintained because of strong government regulations. The Ministry of Trade and Industry directs the suppression of the content of aromatic compounds in gasoline. To meet this request, the content of aromatic compounds in gasoline has been decreasing between 1967 and 1972 both in normal

gasoline and premium gasoline. The sulfur content was 0.012 wt% in premium gasoline and 0.013% in regular gasoline in 1974. These values are much less than those of the U. S., which were 0.027 and 0.039%, respectively. Engine fuels will be improved in the future to meet the social demand to reduce atmospheric pollution and to increase engine efficiency for resources economy.

59250

APTIC NO. 82137

Yoshida, M. and T. Tomita

TOYOTA 4M-U, 4V-U ENGINES OF CATALYST EQUIPPED VEHICLES FOR 1975 JAPANESE EMISSION STANDARD. (*Toyota shokubaishiki 50 nen haiki taisaku 4M-U, 4V-U gata kikan*). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 14(11):73-80, Sept. 1975.

A new 4M-U engine was developed by improving the cylinder head and the exhaust system of the conventional 4M engine used in the Toyota crown and Mark II, and a new 4V-U engine was developed by slightly improving the exhaust system of a conventional 4V engine. The exhaust gas purification apparatus in the 4M-U and the 4V-U engines includes a secondary air supplying device, a catalytic converter, an exhaust gas recirculator (EGR), and an ignition controlling device. Nitrogen oxides concentration in the exhaust from 4M-U engine is reduced by 40% by the EGR alone. The catalytic converter in the 4M-U engine has a capacity of 2.5 l, in which approximately 100,000 pellets of catalyst are packed. Hydrocarbons and carbon monoxide are reduced by 90%. The maximum output and maximum torque of the 4V-U engine is reduced by about 5% as compared to the 4V engine. The catalytic converter has a capacity of 2 l. Test results showed that the carbon monoxide, hydrocarbon, and nitrogen oxides concentrations in the exhaust gases of a Crown 2600 (4M-U engine) and a Century (4V-U engine) (10-modes) were 0.26 g/km, 0.17 g/km and 1.16 g/km, and 0.25 g/km, 0.17 g/km, and 1.13 g/km, respectively.

59251

APTIC NO. 84714

Yoshigi, Hideki

DEODORIZATION OF CHEMICAL INDUSTRY. (*Akushu shori ni tsuite*). Text in Japanese. Yuki Gosei Kagaku Kyokai-shi (J. Soc. Org. Syn. Chem.), 33(5):317-322, May 1975. 10 refs.

Even if the concentration of odorous matter is decreased by 97%, half the odor strength remains. From 1975 5 new odorous substances have been added to the 5 already controlled substances. Control of industrial odor is still new, although the idea itself is not. Physical control methods include adsorption, absorption, masking, and chemical methods, oxidation, reduction, decomposition, neutralization, and ion exchange. Biological treatments include oxygen treatment, sterilization, and fermentation by bacteria. Although combustion is the best method as far as elimination of odor is concerned, taking into consideration secondary pollution, fuel consumption, and equipment for combustion, it may not be the best method. High temperature combustion (over 750 deg) is accompanied by secondary pollution, and low temperature combustion (200-300 C), involving use of catalysts, must take note of odorous substances containing sulfuric compounds. When complete deodorizing is required, adsorption is the best method, and it is desirable to combine it with the use of a scrubber. The ion exchange method is also efficient. Masking is resorted to by industry when standards for emissions are met and yet complaints are made. The most effective masking method is to dissolve masking perfume and deodorant in scrubber liquid to be recycled and supplemented from time to time in accordance with the odor concentration of the emission gas. The addition rate is 600 ml/hr perfume to 100,000 cu m/hr emission gas. According to a report of the Chemical Industry Association, 38% of factories adopt direct combustion methods, 16% use catalytic oxidation, 24% use adsorption, and 22% use absorption method. It is difficult to get rid of odor completely, and it is necessary to combine several deodorizing methods.

59252

APTIC NO. 83762

Yoshino, Masataka, Osamu Tanaka, Hideaki Kusakawa, and Hiromasa Matsuoka

AIR CLEANER. (*Kuki seijoka sochi*). Text in Japanese. (Mitsubishi Electric Corp. (Japan)) Japan. Pat. Sho 50-10708. 4p., April 23, 1975. 1 ref. (Appl. Dec. 28, 1970, 1 claim).

A pipe with a thin and wide cross-section made from a material with good thermal conductivity and moisture permeability is described. A number of pipes are made and piled up in such a way that the direction of gas passage through each pipe is perpendicular to that of neighboring pipes. All the pipes in one direction (A) are filled with a material that absorbs noxious gases. The pipes in the other direction (B) are used to pass the gases to be cleaned. The A pipes are packed with alkaline absorbers such as sodium hydroxide, sodium carbonate, calcium hydroxide, and calcium carbonate if acidic gases such as sulfur dioxide, sulfur trioxide, nitrogen dioxide, chlorine, hydrogen sulfide, or hydrocyanic acid are to be removed. The distribution of these absorbers is such that less is present at the entrance and more is present at the exit. Part of the poisonous gases from the B pipes are transferred to the A pipes by permeation. Thus, the attrition of gas absorbers is minimized. The temperature of the gases in the B pipes rises as the gas proceeds toward the exit. The freezing of absorbers is inhibited. The invention is installed on the external walls of living rooms.

59253

APTIC NO. 83765

Yoshino, Masataka, Osamu Tanaka, and Hiromasa Matsuoka

AIR CLEANER. (*Kuki seijyoka sochi*). Text in Japanese. (Mitsubishi Electric Corp. (Japan)) Japan. Pat. Sho 50-10709. 5p., April 23, 1975. 2 refs. (Appl. Dec. 23, 1970, 1 claim).

A pipe with a thin and wide cross-section made from a material with good thermal conductivity and gas permeability is described. A number of pipes are piled up in such a way that the direction of gas passage through each pipe is perpendicular to that of neighboring pipes. All the pipes in one direction (A) are used to introduce external air into residential rooms. All the pipes in the other direction (B) are used to expel the humid and dirty air from the rooms to the outside. When the air is introduced through the A pipes into a room, the air receives heat and moisture from the outflowing gas in the B pipes. Poisonous gases present in outdoor air are transferred to the gas in B pipes through the wall between pipes A and B. After the passage of outdoor air through the pipe composite, the air is led into a filter, which is filled with layers of gas absorbers. The attrition of gas absorbers is minimized, and about 95% of the noxious gas is removed.

59254

APTIC NO. 82221

Yoshizawa, Shiro, Akira Katagiri, and Kiyoshi Watanabe

STACK GAS DESULFURIZATION METHOD USING CATALYST-ADDED ACTIVATED CARBON. (*Shokubai o tenka shita kasseitan o mochiiru haien datsuryu ho*). Text in Japanese. Preprint, Chemical Society of Japan, Tokyo, p. 44, 1975. (Presented at the Japan Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975.)

During flue gas desulfurization using activated carbon, a part of the activated carbon is consumed by the reduction of adsorbed sulfuric acid during the heat desorption process for adsorbed sulfur dioxide. For the purpose of preventing chemical consumption of activated carbon, the catalytic reduction of H₂SO₄ by hydrogen during the desorption process was investigated using copper, nickel, cobalt, manganese and iron catalyst. The desorption rate of SO₂ varied greatly with temperature. In the case of heating in nitrogen gas without catalyst, the desorption began at about 200 C and was completed at 330-350 C. In the case of heating in H₂ gas with Cu catalyst, the desorption was completed at about 260 C. Heating in H₂ without a catalyst or in N₂ with a catalyst and

the addition of other catalysts showed no effect of facilitating the desorption reaction. The addition of 1 wt% of Cu catalyst was sufficient.

59255

APTIC NO. 80109

Yoshizumi, Kunio, T. Tsukada, and T. Ohira

EFFECTS OF OXYGENATE-GASOLINE BLENDS ON EXHAUST GAS EMISSION. (*Gan sanso kagobutsu no gasorin eno tenka koka*). Text in Japanese. *Anzen Kogaku (J. Japan. Soc. Safety Eng.)*, 14(5): 347-354, 1975. 13 refs.

The effects of fuel additives on reducing automotive emissions were investigated by adding ten types of oxygenates (methanol, acetate, ethyl acetate, acetone, methyl ethyl ketone, methyl ether, and acetaldehyde) to commercial gasoline. The chemical properties of these additives had no direct effect on exhaust gas composition and thermal efficiency. These additives functioned only as oxygen sources and contributed to the variation in percentage of excess air. Reductions in pollutant emission were measured in 10 mode driving and cruising cycles and nitrogen oxides emission increased under certain driving conditions. No abnormal phenomena were observed as the result of the addition of oxygenates; however, the emission of hydrocarbons was generally reduced.

59256

APTIC NO. 82886

Young, Kai-Wing

HYDROGEN SULFIDE REMOVAL FROM WASTE FLUID. (*Union Carbide Corp., N. Y.*) U. S. Pat. 3,876,535. 10p., April 8, 1975. 6 refs. (Appl. April 26, 1974, 13 claims).

A method for removing hydrogen sulfide from both gas and liquid phases of aqueous BOD-containing waste fluid is described. Prior art systems lack a means of removing gaseous H₂S from gases evolved from influent sewage flows prior to a waste water treatment process. The H₂S is absorbed into a minor water stream and added to the sewer water and activated sludge. All are mixed with oxygen gas to chemically oxidize the H₂S and biochemically oxidize the BOD. (Author abstract modified)

59257

APTIC NO. 82126

Young, Richard N. and Larry O. Gray

EXHAUST GAS RECIRCULATION SYSTEM FOR INTERNAL COMBUSTION ENGINES. (*Dana Corp., Toledo, Ohio*) U. S. Pat. 3,915,134. 8p., Oct. 28, 1975. 4 refs. (Appl. March 4, 1974, 10 claims).

An electronically controlled exhaust gas recirculation system for reducing nitrogen oxide emissions from diesel engines is described which is more reliable and accurate than prior art mechanically controlled systems. An exhaust gas recirculation control valve is driven by a feedback circuit which compares the valve position with the engine load. A maximum amount of exhaust gas is recirculated under no load conditions; and, as the load increases to 100%, the amount of recirculated exhaust gas is decreased down to 0%. The amount of recirculated exhaust gas may also be controlled in response to the engine speed to minimize smoke emissions. (Author abstract modified)

59258

APTIC NO. 80169

Yu, A. T.

LOWER COST ENERGY AND HIGHER QUALITY COKE THROUGH COAL BLENDING. *Coal Age*, vol. 1975:112-117, Sept. 1975. 8 refs.

The combined effect of the oil embargo and the sulfur emission standards of the Clean Air Act produced shortages of low sulfur coal. The shortages began to seriously affect the supply of metallurgical coking coal for the steel industry. Sulfur can be removed from the coal before use, but this is expensive. The annual investment and operating costs of scrubbers are also high. Low sulfur western coal has somewhat lower heat

content and is farther from eastern utilities. The potentially most promising alternative is the blending of coal. It may be used in conjunction with the other alternatives. Four determinants are crucial in the selection of a satisfactory coking coal: low ash, low sulfur, low coking pressure, and high coke strength. It is extremely rare that a single coal can satisfy all of these requirements. Even if supply is no problem, blending of metallurgical coal is beneficial. The most commonly used blending technique is the layering of materials either on a belt or in a blending bed. Blending may also be achieved by a matrix bin blending system. Homogenizing techniques are not practical for coal simply because of the exceedingly large volumes to be handled. The use of coal blending at the Four Corners power plant at the intersection of New Mexico, Utah, Arizona, and Colorado is described. Blending insures coal homogeneity and provides a means to use coal previously considered unusable.

59259

APTIC NO. 82064

Yuge, Haruki, Masami Oki, and Naoto Miwa

SYSTEM FOR PURIFYING EXHAUST GAS FROM AN INTERNAL COMBUSTION ENGINE. (*Nippondenso Co., Ltd., Kariya and Nippon Soken, Inc., Nishio (Japan)*) U. S. Pat. 3,910,042. 8p., Oct. 7, 1975. 9 refs. (Appl. May 4, 1973, 13 claims).

A system for purifying exhaust gas from an automobile internal combustion engine is described. The catalyst reaction bed has a blower to prevent the catalyst from being overheated, which is an improvement over known catalytic reactors. The system includes a housing of a catalytic reactor which is connected to an exhaust pipe of the engine to receive exhaust gas from the engine. The reactor is designed to purify the exhaust gas while the gas is passed through. The purified gas is discharged from the reactor through a discharge pipe connected to the reactor housing. The discharge pipe is advantageously axially aligned with the exhaust pipe connected to the housing. The temperature of the reactor bed is controlled by a blower which sends air on a signal from a thermocouple controlled comparator.

59260

APTIC NO. 76356

Zanelli, S.

FUEL OIL COMBUSTION WITH LOW NOX EMISSION. *Riv. Combust.*, 29(5-6):228-235, May-June 1975. 12 refs. (Presented at the Italian Flame Days, Sanremo, April 10-11, 1975.)

A method for the reduction of nitrogen oxide emissions during fuel oil combustion is described. The emission of NO_x in the combustion processes, when liquid fuels are burned, strongly depends on the nitrogen, bound in several organic compounds contained in the oil. A two-stage combustion process decreases the emission level of NO_x. A variable amount of air is supplied to the primary combustion by a jet located near the exit section of an experimental furnace. A post-combustion system with oil flames is effective on the emission level of NO_x even with only 7-10% of the overall air supplied as secondary air. This combustion method is useful in a practical boiler system which burns liquid fuel with an amount of organic nitrogen greater than 0.08%. (Author summary modified)

59261

APTIC NO. 82494

Zeyns, Johannes and Heinz Enneking

APPARATUS IN A COMBUSTION ENGINE INCLUDING A DEVICE FOR CONTINUALLY MEASURING AND INDIVIDUALLY DISTRIBUTING TO A PLURALITY OF FUEL INJECTION VALVES THE AMOUNTS OF FUEL APPROPRIATE TO THE AMOUNTS OF COMBUSTION AIR. (*Assignee not given.*) U. S. Pat. 3,896,778. 12p., July 29, 1975. 8 refs. (Appl. May 11, 1973, 31 claims).

A system for maintaining the optimum air-fuel ratio to each cylinder of an internal combustion engine and thus minimizing

CONTROL METHODS

59267

exhaust pollutants is described. The device differs from prior art designs in that the optimum air-fuel ratio for individual injection valves is maintained in relation to the amount of combustion air drawn in by each working cylinder. The system includes a fuel tank, a pump, a fuel control pipe, and amplifying resistance, a differential pressure regulator, several parallel-connected metering regulators, and several metering resistances. Working in conjunction with the above components is a device which is positioned within the air intake channel for continually measuring and individually distributing to each fuel injection valve the amount of fuel appropriate to the amount of combustion air passing through the intake channel. (Author abstract modified)

59262

APTIC NO. 84286

Zhuchenko, I. P.

EFFICIENCY OF MEASURES FOR THE REDUCTION OF MERCURY VAPOR CONCENTRATIONS AT THE LADYZHIN REGIONAL POWER PLANT. (*Effectivnost meropriyatiy po snizheniyu koncentracii parov rtuti na ladyzhinskoi raionoi elektrostantsii*). Text in Russian. *Gigiena Truda i Prof. Zabolevaniya*, no 8:47-48, 1975.

An exhaust fan was installed to provide improved ventilation. The surface layers of plaster on the walls and ceiling were coated with a mixture of equal amounts of bitumen in benzene and perchlorovinyl varnish. The floors were covered with a mastic on a resin and bitumen base. The used mercury converters were removed and cleaned with potassium permanganate and hydrochloric acid. Mercury vapor concentrations in the power plant decreased tenfold.

59263

APTIC NO. 72724

Environmental Protection Agency, Ann Arbor, Mich., Technology Assessment And Evaluation Branch

EXHAUST EMISSIONS AND FUEL ECONOMY FROM A VOLVO THREE-WAY CATALYST PROTOTYPE VEHICLE. Preprint, 11p., March 1975.

Exhaust emission tests (1972 and 1975 Federal Test Procedures, Environmental Protection Agency Highway Cycle, and steady state tests) were performed on a Volvo prototype vehicle equipped with a three-way catalyst system. A single catalytic converter oxidizes hydrocarbons and carbon monoxide and reduces nitrogen at the same time. The required close control of engine air-fuel ratio is achieved by using the signal from the an exhaust oxygen sensor to control an electronic fuel injection system. The Volvo prototype vehicle met the 1977 emission standard levels at 4000 mi of durability; average hydrocarbon, carbon monoxide, and nitrogen oxide levels ranged from 0.24-0.27, 0.93-1.18, and 1.44-1.96 g/mi, respectively. The catalyst emitted very low levels of both particulate and sulfate (reported as sulfuric acid mist) emissions, with both levels being the lowest of any system tested thus far.

59264

APTIC NO. 76045

PURIFICATION OF FLUE GASES PRODUCED BY ELECTRIC POWER STATIONS FROM SULFUR DIOXIDE BY THE LIMESTONE METHOD. (*Ochistka dymovykh gazov elektrostansiy ot sernistogo angidrida izvestnakovym metodom*). National Scientific Research Inst. for Industrial and Sanitary Purification of Gases, Moscow (USSR), Soviet-American Subgroup Second Work Conf. Proc., Moscow, 1975. Translated from Russian, 12p.

A proposal to study the kinetics of absorption of sulfur dioxide by a limestone suspension using fast absorbers is presented. Laboratory studies will include the kinetics of calcium sulfite oxidation in the presence of liquid-phase catalysts (in order to increase the output coefficient of limestone and obtain gypsum as a by-product); the absorption kinetics of SO₂ in an absorber with moving spherical packing and in a fast-type spray absorber without packing; and sludge disposal from the system by means of filters, centrifuges, and hydrau-

lic cyclones. Laboratory procedures, methods of calculation, and facilities for evaluating the limestone method along these lines are described.

59265

APTIC NO. 76124

Environmental Science and Engineering, Inc.

REPORT ON VISIBLE EMISSIONS AT CALDWELL STONE COMPANY'S LIMESTONE QUARRY, DANVILLE, KENTUCKY. *Environmental Protection Agency Contract, Rept. 75-STN-9, 12p., Aug. 1975.*

Visual observations were made of the collection efficiency of the drill shroud used to contain emissions on the blasting hole drilling unit at a limestone quarry in Kentucky. The quantity of emissions was small relative to those captured by the dust control shroud. No emissions were observed while drilling the second half of the hole, whereas on the first half of the hole emissions were observed escaping from the shroud edges. (Author abstract modified)

59266

APTIC NO. 76347

Research Committee for Air Cleaner Installation and Control Standards (Japan)

STUDIES ON AIR CLEANER MAINTENANCE AND CONTROL STANDARDS IN AIR CONDITIONING BY CENTRAL CONTROL SYSTEMS. (*Chuo kanri shisutemu ni yoru kuki chowa sochi ni okeru kuki seijo sochi no iji, kanri kijun ni kansuru kenkyu*). Text in Japanese. *Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo)*, 13(3):1-17, Aug. 1975. 2 refs.

The present study was conducted in 1973 under a grant from the Ministry of Health and Welfare, Japan, to establish standards for maintenance and control of air purification units, installed as part of air conditioning equipment under a central control system. Suitable regular schedules of equipment inspection should be established. For example, some parts of automatic roller-type air filters should be inspected once a day, while other parts require once a year maintenance. The efficacy of three kinds of air filters (nylon, 15 mm thick; glass fiber, 50 mm thick; acetate, 15 mm thick) was experimentally checked by rooftop experiments conducted for about a month. Nylon material could be regenerated, and had 81% dust collection rate. The other two materials could not be regenerated. Glass fiber had a dust collection rate of 85%; acetate, 97%. Initial pressure losses were 5.0 mm Aq, nylon; 4.5 Aq, glass fiber; 6.6 mm Aq, acetate. General maintenance instructions for various electrostatic air cleaners, air filters, and impact-adhesion air filters, are listed.

59267

APTIC NO. 78063

PARTIAL OXIDATION OF RESIDUAL FUELS.

Hydrocarbon Process., 54(5):115-117, May 1975. 24 refs.

Multistage combustion of residual fuel oils with partial oxidation (gasification) in the first stage at power stations is discussed. The procedure involves incomplete combustion of the fuel in the first stage resulting in the production of fuel gas with sulfur compounds that are mostly converted to hydrogen sulfide. Nitrogen in the fuel is partly converted into harmless nitrogen gas and partly into ammonia which is removed from the gas by washing. The gas obtained is cooled for the production of high-pressure steam. Ash and sulfur compounds are removed from the cooled gas. The cleaned gas is burned again in the combustion chamber of the power plant. The combustion products are free of ash, low in nitrogen oxides (due to the low combustion temperature) and low in sulfur products (90-95% desulfurization). Combined cycle power stations using high-sulfur residual fuel are economically competitive with conventional power stations fuelled with low-sulfur fuel when the price of low-sulfur fuel is about 35-40 cents per million Btu above the price of high-sulfur fuel.

59268

APTIC NO. 80170

(Inventor not given.)

MSV-STACK GAS DESULFURIZATION FACILITY. (WET TYPE ACTIVATED CARBON METHOD). (MSV-haien datsuryu sochi (Shishiki kassei-tan ho)). Text in Japanese. *Ryusan to Kogyo (Sulfuric Acid Ind.)*, 28(8):187-192, Aug. 1975.

A wet type activated carbon method (MSV process) for flue gas desulfurization was developed by Teikoku Kako Co. The process is designed for small to medium size plants, aimed at better performance, continuity and safety. Flue gas containing dusts are first introduced to a dust collector where it is cooled before the dusts were removed. The resulting gas is heated by heat exchange with high temperature flue gas and is led to the absorption-oxidation tower packed with activated carbon. The adsorbed sulfur dioxide is converted to sulfuric acid by reacting with moisture and oxygen. The activated carbon is washed with water when its sulfuric acid content reached 30 wt%, while the gas is led to a second tower. The sulfuric acid is recovered as 10-20% solution. Fiber reinforced plastics are used to insure the mechanical and chemical stability of the equipment. The MSV process is ideal for the treatment of the waste gas from boilers 25 tons/hr - 50 tons/hr in capacity.

59269

APTIC NO. 80229

Environmental Protection Agency, Washington, D. C., Office of Research and Development

LIMESTONE WET-SCRUBBING TEST RESULTS AT THE EPA ALKALI SCRUBBING TEST FACILITY (CAPSULE REPORT). Rept. 4, 16p., 1975.

A wet lime and limestone scrubbing system was tested for sulfur dioxide and particulate removal. Three parallel scrubbers were tested: a venturi followed by a spray tower, a Turbulent Contact Absorber (TCA), and a Marble Bed Absorber. Each can treat approximately 10 Mw equivalent flue gas containing 2300 to 3300 ppm SO₂, and is integrated into the ductwork of a coal fired boiler. Short term factorial limestone tests were conducted at a scrubber inlet liquor pH from 6.0 to 6.2. The venturi and spray tower in series removed up to 80% SO₂ at a total liquid to gas ratio of 80 gal/mcf and a pressure drop to 10 in. water. The three stage TCA scrubber removed up to 96% SO₂ at 64 gal/mcf liquid to gas ratio and 7 in. H₂O pressure drop. A single stage marble bed absorber achieved 80% removal at 40 gal/mcf liquid to gas ratio and 11 in. H₂O pressure drop. The three initial long term reliability verification tests with closed liquor loop operation were run at a reduced scrubber inlet liquor pH (5.7 to 5.9), and consequently reduced stoichiometric ratio, to increase system reliability and limestone utilization. Limestone utilization for the TCA was 83% with 80 to 85% SO₂ removal and a 7 in. H₂O pressure drop. The operability and reliability of the scrubber systems were good. There was little sulfate or sulfite scale after an approximately 500 hr operation on all three systems, each effluent residence times greater than 20 min and over 10% solids recirculated. (Author abstract modified)

59270

APTIC NO. 80432

Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center

CONTROL SYSTEMS LABORATORY CONTRIBUTIONS TO CLEAN AIR. In: *Research and Development Relating to Sulfates in the Atmosphere*. 94th Congress (House of Representatives), First Session, Serial F, p. 216-233, June 1975. (Prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology.)

GPO.

Activities of the Environmental Protection Agency's Control Systems Laboratory are reviewed, with particular emphasis on projects related to the control of sulfur dioxide emissions from stationary sources. Ongoing work in the area of physical desulfurization and coal de-ashing includes: washability testing, fine

coal desulfurization and cleaning, and chemical desulfurization of coal. Progress relating to advanced processes is being made on the development of chemically active fluidized beds, coal and residual oil gasification and desulfurization, and high temperature gas cleanup. Flue gas cleaning techniques which are either presently demonstrated as feasible or are in the process of being developed include: limestone scrubbing, magnesium oxide scrubbing, catalytic oxidation, sodium ion scrubbing with thermal regeneration, and sodium hydroxide scrubbing with electrolytic regeneration.

59271

APTIC NO. 81088

INFORMATION ON THE DEVELOPMENT OF A METHOD OF PURIFYING AGGLOMERATION GASES OF SULFUR DIOXIDE. (Informatsiya o razrabotke sposoba ochistke aglomeratsionnykh gazov ot sernyistogo ангидрида). Soviet-American Branch Group for Ferrous Metallurgy, Sov.-Am. Ferrous Metall. Branch Group Methods Prev. Atmos. Pollut., Working Meet., 1st, 1975, p. 1-5. (Point AM-1-2. of Appendix 3.) Translated from Russian, 4p.

To purify agglomeration gases of sulfur dioxide, a lime method has been widely used in irrigated scrubbers in the Soviet Union as the most effective and economical method. The flue gas extractor forces the agglomeration gases into the scrubber, where they are irrigated with a lime suspension by means of nozzles. The process of absorption and neutralization of SO₂ may be given in the form of a reaction in which calcium carbonate and SO₂ form calcium sulfite and carbon dioxide, the calcium sulfite then reacting with oxygen to form calcium sulfate. The purified gas is discharged into the atmosphere through the smokestack. The constantly renewed lime suspension circulates in a closed system: part of the spent suspension is discharged into the slurry gutter and the required amount of fresh suspension enters the circulation collector. The flow rate of gas in the scrubber is 2.5 m/sec, at 1350 cu m/hr irrigation. Eighty-five percent purification of gas of SO₂ is achieved with 45% to 50% lime. The construction of the scrubber, which contains three collectors, is described. The operating lime suspension is fed to a cyclone filter from the scrubber. The circulation system for this suspension is described. The pumps transferring the spent suspension into the slurry removal system are described. The smokestack and the ducts connecting the scrubber to it are also described. The quantitative and qualitative composition of the agglomeration plant exhaust gases basically depends on the initial raw material and the conditions of agglomeration. The average chemical composition of agglomeration gases before and after purification is given in tabular form. The agglomeration gases contain other components in addition to SO₂. Sulfur dioxide, sulfur trioxide, and dust are primarily the pollutants controlled. The other components that are not significantly absorbed by the lime suspension are discharged into the atmosphere.

59272

APTIC NO. 81517

Ministry of Energy and Electrification (USSR)

METHODS OF COMBATING DUST AT ASH PILES AND COAL DUMPS. (Metody borby s pyleniyem na zolootralakh i ugol nykh skladakh). Preprint, 14p., 1975. (Presented at the Soviet-American Mixed Working Group on Designing and Operating Systems for Protecting the Atmosphere Against Harmful Discharges of Thermoelectric Generating Stations, 2nd Session, Moscow, USSR, Aug. 21, 1974.) Translated from Russian, 13p.

Methods for controlling dust emissions from ash piles and coal dumps located at thermoelectric generating stations in the USSR are reported. The sodding of pile surfaces and boundary dams with perennial grass is the principal method of preventing dust emissions from ash piles. Various inorganic and polymer binders are also used to reinforce the surface of ash piles as a short-term control (1-2 yr). Dust at coal dumps is controlled by the layering and surface packing of piles, par-

ticularly the sides, using bulldozers. (Author conclusions modified)

59273

APTIC NO. 82213

Toyota Motor Co., Ltd.

EMISSION GAS PURIFICATION SYSTEM FOR TOYOTA M-EU TYPE ENGINE AND SUMMARY OF NEW EFI.

(Toyota N-EU gata enjin haishutsugasu joka sisutemu to shin EFI no gaiyo). Text in Japanese. *Gijutsu Joho* (Serv. News), no. 61:2-11, Nov. 1975.

The emission gas purification system for the new mass flow type electronic fuel injection (EFI) engines of Toyota Motors, designed to meet the 1975 exhaust gas emission standards and installed on all M-EU engines, is described. The purification system consists of a catalytic converter (C Co), an ignition timing control system (SD), an exhaust gas recirculation system (EGR), a deceleration control system, a supplementary control system, and a catalyst overheat prevention system. The SD system aims at the achievement of optimum ignition timing so that the emission of hydrocarbons (HC) and nitrogen oxides (NOx) will be minimized. The EGR system aims at lowering the maximum combustion temperature so that the emission of NOx will decline. The deceleration control system utilizes a vacuum limiter to lower the vacuum pressure in the manifold during braking so that the emission of the uncombusted carbon monoxide and HC will be lowered. The supplementary control system inactivates the EGR system and SD system by temperature control so that operation and security of the automobile will be assured. The catalyst control system stops the fuel injection during braking so that the catalyst will not overheat. Also discussed are the characteristics of a mass flow system of an M-EU engine and a summary of the EFI system.

59274

APTIC NO. 82462

CELLULOSE COMPOSTING. METHOD FROM THE U. S. IS BEING TESTED FOR APPLICATION IN THE FEDERAL REPUBLIC OF GERMANY. (*Zellulose Kompostierung. Verfahren aus den USA wird fuer die Bundesrepublik erprobt*). Text in German. *Technische Umweltmag.*, 1975(4):22-24, 1975.

The Varro Conversion System, developed in the USA for waste composting, is described. The method is environmentally favorable because it generates no air pollutant emissions, especially when considering the considerable pollutant emissions generated by waste incinerator plants. The conversion plant has a closed air supply system for the microbial stabilization process.

59275

APTIC NO. 82605

Dept. of Commerce, Washington, D. C., Commerce Technical Advisory Board Panel on Sulfur Oxide Control Technology
REPORT ON SULFUR OXIDE CONTROL TECHNOLOGY. 86p., 1975. 12 refs.

An evaluation of the most economic means for attaining continuous sulfur oxide emission controls on all coal-fired electricity generating plants in the northeastern United States at the earliest date possible is presented. The capacity of all continuous SOx emission control technologies, even with immediate and maximum effort, does not appear to be sufficient to permit control of all coal-fired power plants in the northeastern sector by the end of the 1970 s. The most economical and best all-around choice of SOx control technologies appears to be coal beneficiation in combination with flue gas desulfurization. Specific site and market constraints determine the most economical and practicable emission control technology for a given plant as well as the lead time required for its installation. Low sulfur eastern and western coals emit less than 1.2 lbs of sulfur per million Btu of heat input and are capable of meeting new plant emission standards as well as most State Implementation Plan limits.

59276

APTIC NO. 82607

Zurn Industries, Inc., and Caterpillar Tractor Co., Joliet, Ill.

A CASE HISTORY OF THE ZURN DOUBLE ALKALI FLUE GAS DESULFURIZATION SYSTEM INSTALLED AT THE CATERPILLAR TRACTOR CO., JOLIET PLANT, JOLIET, ILLINOIS. Preprint, *Purdue Univ., Lafayette, Ind.*, 16p., 1975. (Presented at the Industrial Fuel Conference, West Lafayette, Ind., Oct. 8-9, 1975.)

Operating experience with the Zurn double alkali flue gas desulfurization system installed on a coal-fired boiler at the Caterpillar Tractor Company's Joliet Plant in Illinois is described. The process accomplishes sulfur dioxide absorption by the use of an intermediate soluble alkali. After SO₂ absorption, the soluble alkali is regenerated by the addition of lime to precipitate insoluble calcium based compounds. Scrubber outlet SO₂ concentrations in lb/million Btu ranged from 0.11-0.60 for scrubber inlet SO₂ concentrations ranging from 3.76-4.00 lb/million Btu, respectively. The estimated operating cost is \$5.25/ton of coal burned. The system has completed 4200 hr of operation, including 2500 hr of satisfactory continuous operation.

59277

APTIC NO. 82754

Environmental Protection Agency, Ann Arbor, Mich.,
Technology Assessment and Evaluation Branch

THE EFFECT OF IGNITION TIMING MODIFICATIONS ON EMISSIONS AND FUEL ECONOMY. Preprint, 26p., Oct. 1975.

The effect of ignition timing modifications on exhaust emissions and fuel economy was evaluated for 10 1975 vehicles equipped with internal combustion engines. The vehicles were either production or prototype cars and ranged in style from compact to full-size. None of the test vehicles exceeded the 1975 exhaust emission standards for hydrocarbons, carbon monoxide, and nitrogen oxides over the 1975 Federal Test Procedure when the ignition timing was retarded 5 deg. In most cases, retarding the ignition timing increased the emission of CO and decreased NOx emissions. The CO increases ranged from 5-68%, with an average increase of 28%. The average NOx decrease was 15%. Advancing the ignition timing by 5 deg resulted in an average increase in NOx emissions of 19%. No general trend was evident for hydrocarbon and CO emissions.

59278

APTIC NO. 82755

Environmental Protection Agency, Ann Arbor, Mich.,
Technology Assessment and Evaluation Branch

EXHAUST EMISSIONS FROM A DIESEL-POWERED VOLKSWAGEN RABBIT. Preprint, 14p., Oct. 1975.

Exhaust emissions from a 1975 Volkswagen Rabbit sedan equipped with a four-stroke diesel engine were measured using the 1975 Federal Test Procedure. Hydrocarbon and carbon monoxide emissions were within the standards for the 1978 model year, while nitrogen oxide emissions were about three times the 0.4 g/mi level required for 1978. All emissions were well below the 1977 Federal standards. Sulfate emissions ranged from 8.39-10.84 over the Environmental Protection Agency Sulfate Cycle.

59279

APTIC NO. 82756

Environmental Protection Agency, Ann Arbor, Mich.,
Technology Assessment and Evaluation Branch

EVALUATION OF THE ETHYL TURBULENT FLOW MANIFOLD LEAN MIXTURE INDUCTION SYSTEM AS APPLIED TO A BMW TWO-LITRE AUTOMOBILE. Preprint, 11p., May 1975.

Exhaust emissions from a 4-cylinder BMW 2002 equipped with an Ethyl Turbulent Flow Manifold were measured. The Ethyl TFM is a lean combustion system. The carburetor and intake manifold incorporate a number of modifications to improve

the homogeneity of the fuel-air mixture without fuel economy or performance penalties. Hydrocarbon, carbon monoxide, and nitrogen oxide levels, as measured over the 1975 Federal Test Procedure, were 1.20, 8.57, and 2.79 g/mi, respectively, and met the 1975 Federal standards without the use of a catalytic converter.

59280

APTIC NO. 82757

Environmental Protection Agency, Ann Arbor, Mich.,
Technology Assessment and Evaluation Branch

TEST RESULTS ON A MERCEDES-BENZ 220D DIESEL SEDAN EQUIPPED WITH A COMPREX PRESSURE WAVE SUPERCHARGER. *Preprint*, 22p., Aug. 1975. 1 ref.

Exhaust emissions from a Mercedes Benz 220D diesel sedan equipped with a Comprex pressure wave supercharger were measured. The Comprex supercharging system is based on the direct exchange of pulses between the exhaust gas which is under increased pressure and the fresh air using controlled pressure waves. The average hydrocarbon, carbon monoxide, and nitrogen oxide emissions from the supercharged vehicle (1975 Federal Test) were 0.26, 1.34, and 1.39 g/mi, respectively, as compared with 1978 Federal emission standards of 0.41, 3.4, and 0.4 g/mi, respectively. All of the 1977 Federal standards were met by the test vehicle.

59281

APTIC NO. 82758

Environmental Protection Agency, Ann Arbor, Mich.,
Technology Assessment and Evaluation Branch

AN EVALUATION OF TWO HONDA AUTOMOBILES POWERED BY 91 CID STRATIFIED CHARGE CVCC ENGINES. *Preprint*, 13p., 1975 (?).

Exhaust emissions from two 1975 Honda automobiles powered by 91-cubic inch stratified charge engines were measured. Both vehicles were calibrated to achieve the 1977 statutory standards for hydrocarbons, carbon monoxide, and nitrogen oxides. A manual transmission was employed in one vehicle, while an automatic transmission was used in the other test vehicle. The standard transmission model demonstrated the ability to meet all of the 1977 Federal emission standards over the Federal Test Procedure, while the automatic transmission model met the hydrocarbon and NO_x levels but exceeded the CO levels by approximately 0.5 g/mi. Fuel economies of the two vehicles were essentially the same as those of 1975 Honda CVCC certification cars.

59282

APTIC NO. 82759

Environmental Protection Agency, Ann Arbor, Mich.,
Technology Assessment and Evaluation Branch

QEI 400 FUEL ADDITIVE: EMISSIONS AND FUEL ECONOMY EFFECTS ON A LIGHT DUTY GASOLINE POWERED VEHICLE. *Preprint*, 13p., Dec. 1975. 1 ref.

The effect of a fuel additive called QEI 400 on vehicle exhaust emissions and fuel economy was evaluated using a 1971 Ford Galaxie test vehicle with a 351-cubic inch engine and automatic transmission. The fuel used for all testing was Indolene Clear gasoline. Hydrocarbon, carbon monoxide, and nitrogen oxide emissions with the addition of the fuel additive were 2.87, 13.7, and 3.37 g/mi, respectively, on the 1975 Federal Test as compared with baseline values of 2.58, 11.0, and 3.54 g/mi, respectively. Fuel economy was essentially unchanged.

59283

APTIC NO. 82770

Environmental Protection Agency, Ann Arbor, Mich.,
Technology Assessment and Evaluation Branch

EVALUATION OF A CHRYSLER LEAN BURN VEHICLE. *Preprint*, 10p., Oct. 1975.

Exhaust emissions tests were conducted on a Chrysler New Yorker (440-cubic inch engine) equipped with a prototype Chrysler lean burn system. The lean burn system consisted of an induction system operating at an air-fuel ratio of about 18:1

and an electronically controlled spark advance system. Hydrocarbon, carbon monoxide, and nitrogen oxide emissions, as measured on the 1975 Federal Test, were 0.70, 13.10, and 2.72 g/mi, respectively, and met the 1975 Federal emission standards. The system, however, resulted in a significant fuel penalty, with the fuel consumption being 9.0 mi/gal.

59284

APTIC NO. 82772

Environmental Protection Agency, Ann Arbor, Mich.,
Technology Assessment and Evaluation Branch

EVALUATION OF THE ETHYL LEAN REACTOR SYSTEM APPLIED TO A DODGE CORONET. *Preprint*, 12p., Nov. 1975.

Exhaust emissions from a Dodge Coronet (360-cubic-inch V-8 engine) equipped with an Ethyl Lean Reactor System were measured using the 1975 Federal Test Procedure. The Ethyl Lean Reactor System is a lean combustion system which employs the Ethyl Turbulent Flow Manifold in place of the standard induction system and a thermal reactor for exhaust after-treatment. The intake manifold incorporates a number of modifications to improve the homogeneity of the air-fuel mixture without fuel economy or performance penalties. Exhaust emissions from the test vehicle achieved the levels of the 1975-76 Federal and California standards at 52,000 mi of service. Hydrocarbon, carbon monoxide, and nitrogen oxide levels were 0.38, 5.34, and 1.64 g/mi, respectively.

59285

APTIC NO. 83164

ADIABATIC EXPANSION TYPE AUTOMOBILE EXHAUST CLEANER. (Dannetsu bochoshiki jidosha haikigasu seijoki). Text in Japanese. (Aoi, Tsuyoshi (Japan)) Japan. Model Util. Sho 50-36093. 3p., Oct. 21, 1975. 1 ref. (Appl. Aug. 13, 1970, claims not given).

An adiabatic expansion type auto exhaust cleaner is described, which will collect and dispose of sulfur dioxide, nitrogen oxide, lead compounds and carbon particles contained in auto exhaust gas by utilizing the adiabatic expansion phenomena. The new cleaner has a simplified design, is suitable for low cost mass production and very effective in collecting noxious and toxic substances contained in auto exhaust gas. The main design features of the cylindrical cleaner are: a separation chamber for front end treatment in which exhaust gas will be circulated to cause an adiabatic expansion so that comparatively larger particles of noxious and toxic substances will fall out; and three collection chambers with heat resistant fillers separated from the front end with an air tight divider and interconnected horizontally. The collection chamber consists of an expansion chamber made with a horizontal closed ended porous cylinder and a cylindrical coagulation chamber fitted over and surrounding the expansion chamber.

59286

APTIC NO. 83260

Toyo Menka Kaisha Ltd. (Japan)

PREVENTION FACILITIES OF HYDROCARBON DISCHARGE. VOLATILE HYDROCARBON RECOVERING APPARATUS BY ABSORPTION METHOD. (Tanka suiso haishutsu boshi setsubi. Kyushuho ni yoru kihatsusei tanka suiso kaishu sochi). Text in Japanese. Aromatikkusu (Aromatics), 27(11):525-528, Nov. 1975.

Hydrocarbon vapor from gasoline, benzene, and toluene is often released to the air and contributes to smog and malodorous pollution. The pollution prevention regulations require 90% removal of the gasoline vapor at the exhaust outlet of a gasoline vapor treating device. The BTX (Benzene, toluene and xylene) vapor recovery method and device developed by Showa Sekiyu Co., Ltd. using a heavy absorption solvent consisting mainly of esters is introduced. This process can treat exhaust gas containing BTX vapors of initial concentration over 5000 ppm (but preferably over 10,000 ppm). An explanation of the process, the absorption solvent, temperatures and pressures for operation, characteristics, and

economical aspects of the method are presented. This process recovers 99.9% pure hydrocarbons by using a very inexpensive non-volatile and harmless absorption solvent. However, in order to economically meet the stricter regulations, other back end processes such as activated carbon absorption and incineration must be jointly employed.

59287

APTIC NO. 83361

Verband Schweizerischer Oel- und Gasbrennerfabrikanten (VSO), Technische Kommission

FLUE GAS FILTERS FOR OIL FIRINGS, THEIR MODES OF ACTION AND PROBLEMS. (*Abgasfilter bei Oelfeuerungen, Wirkungsweise und Probleme*). Text in German. *Heizung, Lueftung, Haustechnik*, 42(2): 35-36, 1975. 2 refs.

The problems of flue gas filters, designed to prevent corrosion around chimneys by the retention of rust and soot particles larger than 5 micron, are discussed. Such filters are unable to retain fine particles, aerosols, and gaseous pollutants; also, they increase fuel consumption and flow resistance, and reduce the reliability of operation of oil firings. Since they do not contribute to environmental protection, it is better to take measures to eliminate the causes of rust emissions by the use of adequate combustion chambers and soot emissions by the use of modern burners and reducing the number and duration of start-ups than to rely on filters. Soot emissions can also be reduced by the use of low-sulfur oil.

59288

APTIC NO. 83444

Environmental Protection Agency, Ann Arbor, Mich., Technology Assessment and Evaluation Branch

EVALUATION OF A M-151 JEEP AND TWO 1973 FORD CAPRIS POWERED BY 141 CID PRODCO STRATIFIED CHARGE ENGINES. *Preprint*, 38p., June 1975. 1 ref.

Exhaust emissions tests were performed on an M-151 jeep and two 1973 Ford Capris powered by 141-cubic inch Programmed Combustion Process (PROCO) stratified charge engines. Hydrocarbon, carbon monoxide, and nitrogen oxide emissions, as measured over the 1975 Federal Test Procedure, ranged from 0.15-0.26, 0.16-0.87, and 0.26-1.55 g/mi, respectively, as compared to 1977 Federal Interim Standards of 1.5, 15.0, and 2.0 g/mi, respectively. Smoke, aldehyde, and particulate emission levels were equal to or less than those of standard gasoline engines. Sulfate emissions of the PROCO Capri were about 5 mg/mi, the lower end of the range of sulfate emissions generated by conventional engines with catalysts. Fuel economy was increased relative to that of standard gasoline engines.

59289

APTIC NO. 83935

GAS TURBINE PLANT OF THE NECKAR WORKS IN OPERATION. (*Gasturbinen-Anlage der Neckarwerke in Betrieb*). Text in German. *Elektrizitaetswirtschaft*, 74(26):960-961, 1975.

The new gas turbine C, operating within 7.5 min after starting, has a capacity of 80-90 MW, increasing the total energy output of Neckar stations to 970 MW. For clean air conservation natural gas and light oil are used in combination or separately with flue gas discharge through 72 m high smokestacks. The turbine noise does not exceed 35 dB/A when heard at the nearest residential area (450 m). Investments amounted to about 10 million dollars plus 10% for inflationary costs.

59290

APTIC NO. 83990

VENTI WET TYPE DUST SEPARATOR WITH DRY SLUDGE DISCHARGE. (*VENTI-Nassentstauber mit trockener Schlamm-Austragung*). Text in German. *Keram. Z.*, 27(11):592, Nov. 1975.

VENTI wet type dust separators, available for throughput capacities of 6300-80,000 N cu m/hr, are described. The dust

particles to be separated are intensively wetted by water spray for the immediate separation of heavy components, after which the gas-droplet mixture passes a vacuum trough (patented) at the inlet of a spiral duct, and a second trough installed within this duct for final dust separation due to intense turbulence. Sludge removal is done by means of an electromagnetically operated sludge bagger which separates the solid components from the water, i.e., it discharges a compact sludge, thereby reducing the water consumption considerably. Pressure release devices are provided for explosive mixtures. The VENTI scrubbers are recommended for use in metallurgical and metal processing plants (foundries, grinding and sand-blasting shops), and in wood processing and lacquering plants.

59291

APTIC NO. 84406

INTRODUCTORY REPORT BY THE SECRETARIAT.

Preprint, Economic Commission for Europe, 42p., 1975. (Presented at the Desulfurization of Fuels and Combustion Gases Seminar, 2nd, Washington, D. C., Nov. 11-20, 1975.)

An overall review of progress made on the desulfurization of fuels and combustion gases is presented. The topics include: sulfur dioxide emission; standards and criteria; ambient standards; emission standards; limitation of sulfur content in fuel; methods for the evaluation of potential damage by SO₂; energy and fuel consumption in member countries; S content of fuel; trace materials in fuels; natural gas consumption; major stationary emission sources; requirements for low S fuel; status of flue gas desulfurization; by-products utilization and disposal; and nitrogen oxides emission.

59292

APTIC NO. 84456

Enviroplan Inc., Rutherford, N. J.

MAXIMUM SO₂ CONCENTRATIONS PRODUCED BY A 1000 MEGAWATT POWER PLANT. *Environmental Protection Agency Contract 68-01-2837, Rept. EPA-230/1-75-002, PM-221, 78p., April 1975. 24 refs.*

NTIS: PB 241756

The effect of alternative strategies for complying with Federal New Source Performance Standards for sulfur dioxide emissions from coal-fired power plants are examined in relation to annual average, maximum 24-hour, and maximum 3-hour SO₂ concentrations from a new hypothetical 1000-megawatt electric power plant. The use of a wet limestone scrubber with conventional reheating of the stack exit gases to 170 F results in the highest SO₂ concentrations with annual average, maximum 24-hour, and maximum 3-hour values being 1.69, 55.01, and 234.28 micrograms/cu m, respectively. The use of low sulfur oil results in the lowest SO₂ concentrations, with annual average, maximum 24-hour, and maximum 3-hour values being 0.95, 38.44, and 173.90 micrograms/cu m, respectively. The use of wet limestone scrubbing with extreme reheating of the stack exit gases to 250 F results in SO₂ concentrations that lie between those of the above two alternatives.

1974

59293

APTIC NO. 83355

Absher, Larry R. and Richard M. Woodie

AIR TREATING APPARATUS. (*Assignee not given*) U. S. Pat. 3,841,063. 4p., Oct. 15, 1974. 6 refs. (Appl. Nov. 8, 1971, 3 claims).

An apparatus for removing fly ash, dust, and other types of solid particles from flues and stacks to reduce air pollution is described. Smoke, ash, and dust are drawn or pushed by a fan into a barrel-like configuration having a series of water spray jets mounted therein. Spraying the ash or dust increases the weight causing it to settle to the bottom of the barrel-like member. The apparatus may be placed directly upon a stack or supported upon a tower located adjacent the stack. Unlike

other devices, this device requires no filters, baffles, or tortuous separating passages for separating the contaminants from the gases. (Author abstract modified)

59294 APTIC NO. 80958

Acres, G. J. K., A. J. Bird, and P. J. Davidson

RECENT DEVELOPMENTS IN PLATINUM METAL CATALYST SYSTEMS. *Chem. Engr. (London)*, vol. 1974:145-157, March 1974. 6 refs.

Three reactions were studied over palladium charcoal catalysts of differing metal distributions. Maximum activity for the hydrogenation of benzoic acid at atmospheric pressure was obtained with external metal crystallites on a high area support. Placing the metal within the pore structure confers poison resistance, and is more active than its exterior metal counterpart for the same reaction at 100 atmospheres pressure. The selectivity is affected by mass transport. Systems where a transition metal complex is chemically bonded to a suitable support are discussed. The main criterion for a catalyst support is a reactive functional group which can form a stable bond to a transition metal complex. Supported homogeneous systems are very adaptable catalysts and appear to combine the advantages of both homogeneous and heterogeneous catalysts without their disadvantages. Catalyst units can control exhaust emissions from motor vehicles for 50,000 mi. Promoters in the basic platinum catalyst system can achieve substantial improvements in light off temperature, conversion efficiency, and long term catalyst durability. Most nitrogen oxides emission catalyst systems used with a second catalyst unit for carbon monoxide and hydrocarbon emission control are based upon ruthenium. The essential features of a reactor for catalytic exhaust emission control are discussed. The rate controlling step in this system under most operating conditions is diffusion of reactants from the gas phase to the catalyst surface. Consequently, the physical properties and type of catalyst support used are important as well as the surface to volume ratio and geometry of the catalyst bed.

59295 APTIC NO. 67082

Agarwal, M. R.

POLLUTION CONTROL ASPECTS OF FCI TROMBAY UNIT. *Fertiliser News*, 19(3):20-22, March 1974.

The emissions and pollution control at the Trombay factory of the Fertilizer Corporation of India, Ltd. are discussed. The factory consists of a 350 tons/day ammonia plant, a 300 tons/day urea plant, a 700 tons/day complex fertilizer plant, a 200 tons/day sulfuric acid plant, a 320 tons/day nitric acid plant, a 60 tons/day concentrated nitric acid plant, a 100 tons/day phosphoric acid plant, and other plants. Under normal conditions the H₂SO₄ plant emits 0.2%/vol sulfur dioxide and 0.03-0.06%/vol H₂SO₄, according to design. Pollution control to reduce acid mist and SO₂ were provided by a turbulence filter and a double catalysis-double absorption process based on the Bayer process. The nitric acid plant emits less than 0.05% nitric oxide from the treated colorless gas. The control treatment includes a catalytic combustor. The concentrated nitric acid plant emits about 2% nitrogen oxides (about 148 kg/day nitrogen dioxide). Fluorine emissions from the phosphoric acid plant are recovered. Modifications are being effected in old plants and control equipment is being installed in expanded facilities, so that the plant will meet international emission standards.

59296 APTIC NO. 67105

Akhtar, Sayeed, A. G. Sharkey, Jr., J. L. Shultz, and P. M. Yavorsky

ORGANIC SULFUR COMPOUNDS IN COAL HYDROGENATION PRODUCTS. Preprint, American Chemical Society, Washington, D. C., 8p., 1974. 4 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., March 31-April 5, 1974.)

AIR POLLUTION ABSTRACTS, JUNE 1976

Organic sulfur compounds in coal hydrogenation products resulting from the Bureau of Mine's Synthoil process for coal conversion to low-sulfur fuel oil were determined by mass spectrometry in order to obtain subsequent qualitative information on their relative ease of decomposition by a cobalt-molybdenum/silica-alumina catalyst used in the process. The liquid products contained 14 organic sulfur compounds, 13 of which were thiophene derivatives. Their relative ease of decomposition was determined by repetitive hydrodesulfurization of coal slurries with the catalyst. Dibenzothiophene was the most difficult to decompose, followed by benzothiophene and naphthobenzothiophene.

59297 APTIC NO. 84469

Anderson, Wendell L., William S. Magee, Jr., and Leonard A. Jonas

AEROSOL FILTRATION BY FIBROUS FILTER MATS: PART III GEOMETRIC RELATIONS. *Atomic Energy Commission, Washington, D. C., Harvard Air Cleaning Lab., and Lawrence Berkeley Lab., AEC Air Clean. Conf. Proc., 13th, San Francisco, Calif., 1974, p. 445-465. 8 refs. (Aug. 12-15.)*

NTIS: CONF - 740807

The aerosol filtration characteristics of 10 randomly formed fibrous filter mats of widely varying compositions and physical properties were studied as a function of both the superficial linear flow velocity and the aerosol diameter size. The flow regime ranges from 7.2 to 141 cm/sec with 10 discrete velocities. Four diameter sizes of diocylphthalate (DOP) aerosol were used to challenge the filter mats over this velocity range, 0.26, 0.28, 0.30, and 0.32 micron. Mathematical equations, derived from the original Dorman aerosol equations, provide insight on the interrelationships between aerosol size, flow velocity, and the diffusion, interception, and inertia mechanisms of aerosol filtration. (Author abstract)

59298 APTIC NO. 83962

Andreasson, Stig

INDUSTRIAL ODOR PROBLEM. (*Industriella luktproblem*). Text in Swedish. *Kem. Tidskr.*, 86(12):70, 73, 1974.

Methods and examples for the control of malodorous emissions in industrial processes are described. Condensation at low temperature, absorption, chemical oxidation with ozone, hypochlorite, hydrogen peroxide, potassium permanganate, chlorine dioxide or other chemicals, adsorption, usually on activated carbon, and thermal or catalytic incineration are the methods used commonly to control malodorous emissions. Ethylacrylate, with an odor threshold of 0.005 ppm, can be separated from air by scrubbing with 10% sodium hydroxide solution at efficiencies over 90-99%. Aldehydes and other malodorous substances emitted during lacquer drying operations can be destroyed by catalytic incineration with platinum-coated chromium-nickel steel wires at an efficiency of 90-95%. Solvents can be recovered by adsorption on activated carbon and subsequent regeneration of the adsorbent with steam under 2.6-3 atm pressure at 100 C. The absorption efficiencies may be over 99%, and recovery rates over 90% can be achieved.

59299 APTIC NO. 80471

Avers, Carl E.

DISTRICT HEATING AND COOLING WITH A SOLID WASTE FUELED PLANT. *International District Heating Assoc., Pittsburgh, Pa., Intern. Dist. Heating Assoc., Annu. Meeting., 65th, Copperstown, N. Y., 1974, p. 49-52. (June 24-26.)*

Air pollution control at a solid fueled plant is discussed. Spraying cools the ash and eliminates dust during the removal process. Combustion air promotes burning of odors in the boiler-incinerator, thus eliminating any potential odor problems in the plant air. The flue gases go through sophisticated par-

ticulate and gas collection devices in order to meet emission criteria. The gases first are subjected to a dry cyclone to remove the remaining particulates and water soluble gaseous constituents. Particulate matter and sulfur dioxide emission control are accomplished with the combination of dust collectors and a series of wet scrubbers. The current level of particulate and SO₂ emissions will be reduced by 75 and 90% respectively, over the existing inbuilding systems that are being replaced by a thermal plant.

59300

APTIC NO. 83601

Balluff, Robert N.

LOUVERED CATALYTIC CONVERTER FOR PURIFYING EXHAUST GASES. (Tenneco Inc., Racine, Wis.) U. S. Pat. 3,840,346. 4p., Oct. 8, 1974. 9 refs. (Appl. April 11, 1972, 4 claims).

A louvered catalytic converter is described for purifying exhaust gases. It is used with beds of nonmetallic particulate material, such as catalyst pellets or fibrous, acoustic packing and minimizes losses of the material due to abrasion. The louvers are formed with lips that extend outwardly of the walls of the bed to minimize the sharp edges that are presented to the particles and to minimize gas turbulence. (Author summary modified)

59301

APTIC NO. 83618

Barber, Ernest C.

PROCESS FOR AIR POLLUTION ABATEMENT. (Texaco, Inc., New York) U. S. Pat. 3,844,942. 5p., Oct. 29, 1974. 9 refs. (Appl. Nov. 17, 1971, 2 claims).

A process for air pollution control is described in which hydrogen sulfide dissolved in water produced from subterranean hydrocarbon reservoirs is reduced in concentration so that it will have little tendency to escape into the atmosphere as the water reaches atmospheric pressure. The process takes place in a plurality of reactors. Catalytic oxidation of dissolved H₂S occurs in the first reactor which is covered. Unreacted H₂S gas evolving from the water in the first reactor is essentially completely reacted in the subsequent reactors. This is an improvement over prior art processes which cannot dispose this escaping H₂S. (Author abstract modified)

59302

APTIC NO. 73320

Baron, Gerhard

PRESSURE GASIFICATION PROCESSES AND THEIR PROSPECT OF DEVELOPMENT. (Druckvergasungsverfahren und ihre Entwicklungsmöglichkeiten). Text in German. Chem.-Ing.-Tech., 46(22):943-950, 1974. 9 refs.

A survey of world reserves of petroleum, natural gas, and coal and world consumption of these raw materials is followed by an account of the development of the Lurgi pressure-gasification process for lignite up to the end of World War II, and subsequent extension to the gasification of coking coal. Particular attention is paid to the degassing behavior of fuels at pressures of 1 bar and 20 bar and on reactivity measurements at constant temperature and at rising temperatures, and the effect of degassing on the gasification properties of solid fuels. After a discussion of the advantages and disadvantages of Lurgi pressure gasification, the future development of fixed bed gasification, particularly with regard to pressure increases up to 100 bar, is considered. The application of coal gasification under high pressure for the purpose of producing gases free of sulfur and dust, which can be used in power plants is promising. In such cases air is used instead of oxygen for gasification. The gas is supplied to the power plant with a temperature of 160 to 170 C. The high water vapor fraction in the crude gas and the higher nitrogen fraction of about 40% due to the use of air are acceptable only because due to the higher pressure and the low gasification temperature the methane fraction as well as the carbon monoxide and hydrogen content are sufficiently high for a good combustion process. The first

large-scale plant of this kind has been erected in Luenen. The plant comprises five gas generators with a shaft diameter of 3.2 m and a capacity of 200,000 cu m dry crude gas/hr. The gas is generated under a pressure of 20 bar. The efficiency of the plant is 37%. The gas cleaning system is followed by a hydrogen sulfide scrubber where under increased pressure and a temperature of more than 120 C all sulfur is removed.

59303

APTIC NO. 76315

Barthel, Y.

SULFUR RECOVERY IN REFINERIES BY THE IFP PROCESS. (Recupero dello zolfo nelle raffinerie con processo IFP). Text in Italian. Nuova Chim. (Rome), 50(11):36-38, 1974. 6 refs.

The Institut Francais du Petrole has developed two commercial processes which reduce incineration sulfuric anhydride fumes to 1500 and 150 ppm. In the IFP-1500 process, discharged gases are injected at the base of a cylinder in which there is ample space for contact between liquid and gaseous phases. Countercurrent to the gas circulates a solvent which contains a dissolved patented catalyst. The latter forms a complex with hydrogen sulfide and sulfur dioxide which in turn reacts with the gases to regenerate the catalyst as well as elementary sulfur. The temperature is kept at about 250-270 F, which maintains the sulfur in a molten state while avoiding sulfur and glycol losses. As the sulfur accumulates, it is removed by a valve. The gases at the top of the cylinder are transported to a burner. Conversion schemes for the IFP-1500 will depend on the concentration of hydrogen sulfide and sulfur dioxide in the discharged gases and on the filling of the cylinder. The process is flexible and does not react to variations in the speed of the gas flow. Every 2 years, it is necessary to remove the catalyst with a warm water wash. The IFP-150 process is basically a variation of the IFP-1500 for the purification of sulfur dioxide currents. The IFP process is complemented by an ammonia purification section. Sulfur dioxide content can be reduced to 200 ppm.

59304

APTIC NO. 79264

Barthel, Y., S. Franckowiak, and R. Odello

DESULFURIZATION OF SULFUR PLANT FUMES AND COMBUSTION EXHAUST GASES. (Desulfurization des fumées d'usine à soufre et des fumées de combustion). Text in French. Inform. Chim., no. 136:235-238, 1974.

The Clauspol 1500 and Stackpol 150 methods, developed for the desulfurization of sulfur plant-generated gases and flue gases are described. The Clauspol 1500 method, developed to increase the sulfur recovery rate at Claus plants to at least 99%, converts hydrogen sulfide and sulfur dioxide dissolved in polyethylene glycol into sulfur and water in a low-temperature homogeneous catalytic process. The Stackpol 150 method has been developed for the purification of gases, including flue gases, which contain SO₂ to a residual SO₂ content of below 200-300 ppm. This method is especially suitable for power plants. According to this method, the SO₂ and sulfur trioxide present in the flue gases are reacted with ammoniacal solution to obtain ammonium sulfite, ammonium sulfate, and monobasic ammonium sulfite. The sulfates are reduced thermally by means of sulfur. The gaseous effluents from the evaporator contain SO₂ and ammonia. They are fed into a catalytic section in which about 2/3 of the SO₂ is reduced to H₂S by means of hydrogen and carbon monoxide. The mixture containing H₂S and SO₂ is then sent to a Clauspol 1500 type converter to obtain elemental sulfur.

59305

APTIC NO. 76468

Beall, S. E., Irving Spiwak, Harry G. Arnold, Howard W.

McLain, E. S. Bettis, Dunlap Scott, and Basheer Ahmed

AN ASSESSMENT OF THE ENVIRONMENTAL IMPACT OF ALTERNATIVE ENERGY SOURCES. Union Carbide Corp., Oak Ridge, Tenn., Oak Ridge National Lab.,

Nuclear Regulatory Commission Contract W-7405-eng-26, Rept. UC-13, 128p., Sept. 1974. 12 refs.

NTIS: ORNL-5024

The environmental effects of the various energy systems that have been proposed as alternatives to large fossil-fueled or nuclear power plants are assessed. Despite problems including release of noxious gases from the steam or brine, geothermal energy extraction appears to be an attractive alternative, especially in the western states. The discussion of solar energy includes thermal conversion of solar energy, photovoltaic cells, natural collectors, and tidal energy. The feasibility of fusion power has not been demonstrated. The alternatives are analyzed economically as well as environmentally, and the environmental analysis includes effects on land, water, and human health as well as air.

59306

APTIC NO. 80231

Berger, Beverly J.

ENVIRONMENTAL ASPECTS OF METHANOL AS VEHICULAR FUEL: HEALTH AND ENVIRONMENTAL EFFECTS. Preprint, California Univ., Livermore, Lawrence Livermore Lab., 12p., 1974. 16 refs. (Presented at the Methanol Alternate Fuel Conference, Henniker, N. H., July 7-12, 1974.)

Environmental and health consequences predicted as a result of using methanol as a transportation fuel are summarized. The relative effects of the new fuel as compared with gasoline, rather than the absolute effects, are important. Automotive emissions and all aspects of fuel use, including distribution, industrial exposure, consequences of miscellaneous home use, as well as effect on terrestrial and aquatic ecosystems, should be studied. Overall evidence shows reductions in hydrocarbons and carbon monoxide from methanol fueled vehicles. The hydrocarbons are generally less reactive than those from gasoline fueled engines. Most known carcinogens in automotive exhausts are aromatic hydrocarbons. Methanol gasoline blends may reduce aromatic emissions by reducing the need for the aromatic additives as octane boosters. When catalytic converters are used, fuel sulfur level must be considered. The anticipated sulfur level in methanol will be close to zero. The effects on human health as a consequence of emissions from methanol fired as compared to gasoline fired automobiles include reduction in adverse effects of photochemical smog and elimination of the possibility of lead toxicity. The recommended atmospheric concentration is less for methanol than for gasoline. Vapor loss from fuel pumps and carburetors and at gas stations should be estimated to verify that the threshold limit value for methanol is not exceeded. Replacing gasoline with methanol or methanol-gasoline blends may reduce photochemical oxidant levels, with beneficial effects for plant and animal life. Methanol spills are also considered.

59307

APTIC NO. 83467

Besalke, Robert E.

AIR POLLUTION CONTROL IN THE REFRACTORIES INDUSTRY. AICHE Symp. Ser., 70(137):39-42, 1974. 7 refs.

Air pollution problems associated with various processes of the refractory industry are reviewed along with control techniques currently being utilized. During mining operations, incineration is used for the disposal of trees and undergrowth vegetation, and overfire air is used to insure complete combustion and minimal pollutant formation. Wetting techniques and proper handling procedures are used to minimize dust emissions occurring during raw clay handling. Techniques used to control particulate and gaseous emissions from rotary dryers, rotary kilns, multiple hearth furnaces, and shaft kilns employed for drying and calcining operations include cyclones, baghouses, settling chambers, scrubbers, and electrostatic precipitators. Local exhaust ventilation is the predominant method of inplant dust control during product manufacturing operations. Process isolation and process dust wetting are additional control measures used in the refractory industry.

59308

APTIC NO. 79285

Bethea, Robert M.

ENGINEERING ANALYSIS AND ODOR CONTROL. In: *Industrial Odor Technology Assessment*. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 13, p. 203-214. 19 refs.

Basic techniques for odor control are discussed, with particular emphasis on design and operational criteria. The techniques reviewed include: process modification, thermal and catalytic combustion, absorption and reactive scrubbing, adsorption, and masking or counteraction. Direct combustion is the most effective technique for controlling high concentrations of odors in low volumes of air; odor control by catalytic oxidation possesses the advantage of lower operating temperatures and lower fuel costs. Gas absorbers and reactive scrubbers are quite flexible in application and can be highly effective. They possess large capacities at reasonable pressure drops. Adsorption is an effective and economical control method for emissions with low concentrations of odorous compounds.

59309

APTIC NO. 79286

Bhatia, Mahesh V. and Paul N. Cheremisinoff

COMBUSTION METHODS FOR ODOR CONTROL. In: *Industrial Odor Technology Assessment*. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 14, p. 215-254. 14 refs.

A review of combustion methods for odor control is presented. Topics covered include: the operation of various incinerator types (direct flame, thermal, and catalytic); the thermodynamics and kinetics of combustion processes; incinerator design principles involving combustion temperature, residence time, and mixing or turbulence; heat recovery systems for incinerators and afterburners; and the design of burners for incineration and afterburning systems. Successful applications of combustion to odor control are reviewed for kraft pulping processes, varnish cookers, coffee roasting operations, and wire enameling processes.

59310

APTIC NO. 83602

Bier, Kenneth C.

EXHAUST GAS RECIRCULATION SYSTEM. (Colt Industries Operating Corp., New York) U. S. Pat. 3,842,814. 6p., Oct. 22, 1974. (Appl. Dec. 15, 1972, 12 claims.)

An exhaust gas recirculation system for recirculating a portion of the engine-developed exhaust gases back to the intake of the engine is described. The system provides exhaust gas recirculation to the associated engine in any desired relationship to engine operation. The exhaust recirculation valve and the throttle valve are not mechanically coupled as in other systems, which eliminates the possibility of the throttle valve being held open by a stuck recirculation valve. A high degree of calibration flexibility is obtained by varying the contours of the control valve, or the recirculation valve, or the contour of the cam, or by varying the rates of spring.

59311

APTIC NO. 83473

Billings, Charles E.

AEROSOL FILTRATION TECHNOLOGY FOR SOURCE EMISSION CONTROL. AICHE Symp. Ser., 70(137):341-350, 1974. 8 refs.

The particulate collection performance of fabric filters is discussed in terms of physical and chemical processes which occur at the molecular level, at the particle-particle-fiber level, and at the macroscopic level. Molecular and interfacial phenomena between particles and fibers include: adhesion, adsorption, the effects of molecular films of vapors, lubrication, friction, wear, electrostatic charge, charge conduction, the chemical composition of the fabric as well as the dust and gas, the effect of polymer additives or fillers used for filter protec-

tion, and diffusion caused by Brownian motion. Microscopic processes at the particle-particle-fiber level include: flow through porous media, particle accumulation phenomena, deposit formation, and deposit removal. Technical measurements are not well developed for the characterization of significant properties of the particle-fabric system important in deposit formation and in cleaning. Macroscopic theory of fabric filter performance is inadequate to permit the prediction of system behavior better than to the correct order of magnitude, except in applications similar to those with previous operating experience. (Author summary modified)

59312

APTIC NO. 84470

Bogardus, H. F., R. C. Clark, J. K. Thompson, and G. H. Fielding

ENHANCEMENT OF FILTER MEDIA PERFORMANCE BY CORONA-FREE ELECTRIC FIELDS. *Atomic Energy Commission, Washington, D. C., Harvard Air Cleaning Lab., and Lawrence Berkeley Lab., AEC Air Clean. Conf. Proc., 13th, San Francisco, Calif., 1974, p. 1029-1038. 12 refs. (Aug. 12-15.)*

NTIS: CONF - 740807

The dielectrophoretic filtration of aerosols is discussed and methods of enhancing filter media performance using corona-free electric fields are described. Aerosol dielectrophoresis occurs when an aerosol and a glass fiber filter medium are exposed together in an electric field. The aerosol particles are polarized by the field, and experience a dielectrophoretic force in the field nonuniformities caused by the glass fibers. Using a commercial fibrous glass filter medium between flat screen electrodes providing a field strength of 11 kv/cm, and at the manufacturer's rated pressure drop of 0.4 inch w.g., the filtration efficiency of the medium is increased from the normal 68% to 98% with a 0.3 micron aerosol, and from 78 to 99% for a 1 micron aerosol. Electrification decreases aerosol penetration of the medium by factors of 16 and 22, respectively. (Author abstract modified)

59313

APTIC NO. 79290

Boll, Carleton H.

ACTIVATED CARBON SOLVENT RECOVERY. In: *Industrial Odor Technology Assessment*. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 20, p. 337-340.

The use of activated carbon adsorption for the removal of vaporized hydrocarbons from gas streams is discussed. Activated carbon solvent vapor recovery can be considered for almost every operation where the solvent is used as a carrier in producing a product and is eventually evaporated off the product and into an air stream. Activated carbon is not recommended for situations where there are extremely low concentrations (below 500 ppm) of solvent in the air streams or where there are gross amounts of contaminants in the solvent-laden air that can poison or blind the pores of the carbon. The cost of an activated carbon solvent vapor recovery plant is generally based on the air volume handled. A detailed breakdown of operating, investment, and maintenance costs for a solvent vapor recovery system serving a coating operation is presented.

59314

APTIC NO. 81802

Bosch, P. J. W. M. Van Den and W. A. De Jong

REMOVAL OF SO₂ FROM WASTE GASES BY REACTION WITH MNOX ON GAMMA-ALUMINA. *Advan. Chem. Ser., no. 133:571-587, 1974. 27 refs. (Presented at the American Chemical Society, American Institute of Chemical Engineers, Canadian Society for Chemical Engineering, and European Federation of Chemical Engineering International Symposium on Chemical Reaction Engineering, 3rd, Evanston, Ill., Aug. 27-29, 1974.)*

Sulfur dioxide can be removed from oxygen-containing waste gases by reaction with manganese oxides on gamma-alumina between 300 and 600 C. Isothermal swing operation with a fixed-bed reactor system is theoretically possible since reduction of the resulting manganese sulfate with hydrogen is reasonably rapid at 475 C. Kinetic data obtained from experiments in a thermobalance are used in calculations with a mixed homogeneous/heterogeneous fixed-bed reactor model, and the results agree semiquantitatively with experimental data obtained on a fixed bed containing manganese sulfate on gamma-alumina. (Author abstract modified)

59315

APTIC NO. 83626

Brandt, Herbert

EXHAUST GAS TREATMENT. (*Apparatebau Rothemuhle Brandt and Kirtzler, Wenden, Ortsteil Rothemuhle (Federal Republic of Germany)*) U. S. Pat. 3,844,740. 6p., Oct. 29, 1974. 10 refs. (Appl. Dec. 10, 1973, 7 claims).

A method of exhaust gas treatment is described in which exhaust gas from a boiler plant is cooled by a liquid, saturated with water vapor, and then reheated. Problems of clogging or corrosion during the reheating, common in other systems, are avoided by providing for introduction of the wet gas and hot air into a mixing flue in envelopes. The hot air surrounds the gas during reheating so that any contact between any surface and gases below the dew point of the gas is avoided. The air is preferably given a rotational flow so that an envelope of it is maintained outside the gas for some way beyond the end of the coaxial part of the flue. (Author abstract modified)

59316

APTIC NO. 83296

Brannland, Rolf Carl August, Bengt Goran Hultman, and Jertil Valdemar Hubert

PROCESS FOR REDUCING EMISSION OF HYDROGEN SULFIDE WHEN WASHING SULFUR DIOXIDE-CONTAINING WASTE GASES OBTAINED FROM THE BURNING OF CELLULOSE WASTE LIQUOR. (*Mo Och Domsjo Aktiebolag, Ornskoldsvik (Sweden)*) U. S. Pat. 3,842,160. 5p., Oct. 15, 1974. 1 ref. (Appl. Dec. 29, 1971, 12 claims).

A process for reducing emission of hydrogen sulfide when washing sulfur dioxide containing waste gases obtained from the burning of cellulose waste liquor is described. Hydrogen sulfide emission is reduced considerably when the aqueous washing liquor has a pH within the range 6 to 7. (Author abstract modified)

59317

APTIC NO. 83519

Broadbent, David

ENERGY CONSERVATION AND POLLUTION CONTROL IN THE PAINT FINISHING INDUSTRY. *Prod. Finishing, 27(7):8-12, July 1974.*

A system of effluent incineration for energy conservation and pollution control in the paint finishing industry is described. The Effluair system operates at well above the 90% reduction requirement of hydrocarbon emissions and incorporates heat recuperation to give an overall thermal efficiency greater than that of an equivalent conventional plant. It is substantially superior to the performance of a plant with unsophisticated pollution control equipment. Polluted oven gases are exhausted to an incinerator where the temperature is raised to the critical reaction point at which the complex hydrocarbon materials are oxidized to carbon dioxide and water. These hot gases are passed through a heat exchanger unit and then to the atmosphere. In the heat exchanger a large part of the heat of combustion is recovered by the incoming fresh air and this warm air is supplied to the direct fired reheat burners. A separate system serves the sealer and color paint ovens, and the heat recovered from the incineration of the fume from the sealer oven is used to warm the air supply to the color oven as well as that to the sealer oven.

59318

APTIC NO. 81954

Brost, O.

SWINGFIRE HEATING TUBE WITH ENVIRONMENTALLY FAVORABLE OPERATING PROPERTIES.

(Ein Waermerohr-Schwingfeuergeraet mit umweltfreundlichen Betriebseigenschaften). Text in German. DECHEMA-Monograph, vol. 1974:261-270, 1974. 10 refs.

The swingfire heater unit is designed on the principle of the Helmholtz resonator. An automatically maintained, pulsing combustion is obtained, which sucks in the combustion air and the fuel automatically. Inadequate preparation of the mixture gives rise to carbonization of the fuel in the mixing chamber in the case of conventional instruments with liquid fuels. This results in an unacceptable rise in the carbon monoxide content of the waste gases. It is possible, by designing the mixing chamber as a heat pipe, to avoid this carbonization and keep the CO content low. (Author abstract)

59319

APTIC NO. 83468

Brown, G. N., S. L. Torrence, A. J. Repik, J. L. Stryker, and F. J. Ball

CONVERSION OF STACK GAS SO₂ TO ELEMENTAL SULFUR BY AN ACTIVATED CARBON PROCESS.

AICHE Symp. Ser., 70(137):123-131, 1974. 3 refs.

An all dry process utilizing fluidized beds of recycled coal-based activated carbon for the removal of sulfur dioxide from flue gases at stack temperatures and the production of by-product elemental sulfur is described. The process is currently in the pilot plant stage but is being scaled up for commercial application to power plants. The fluidized beds can be added to the stack with minimal interruption to the power train. Better than 95% SO₂ removal is achieved for inlet SO₂ concentrations of 2000 ppm, and better than 70% SO₂ removal is realized for inlet concentrations of 4000 ppm. Higher removal rates can be obtained by increasing the bed depth of carbon per stage.

59320

APTIC NO. 83274

Calderon, Albert

METHOD OF CONTROLLING EMISSIONS FROM FURNACES.

(Assignee not given.) U. S. Pat. 3,844,769. 7p., Oct. 29, 1974. 7 refs. (Appl. April 10, 1972, 4 claims).

A method and apparatus for collecting the fumes from industrial furnaces are described. The fumes of rotatable steel making furnaces, especially bottom blown furnaces employing tuyeres or perforation are collected. A fume collecting hood is provided which is rotatable in conjunction with a blowing furnace in order to accompany the mouth of the furnace and thereby collect its emissions under any angular position of the furnace. (Author abstract modified)

59321

APTIC NO. 83562

Cannon, Thomas

ENERGY RECOVERY FROM SOLVENT VAPORS. *Pollut. Eng.*, 6(11):36-37, Nov. 1974.

Adsorption techniques in metal finishing plants are discussed. Activated carbon has a definite capacity to adsorb vapors. If this capacity is exceeded, vapors pass through the C bed. The bed is then regenerated. Low pressure live steam is used in this process. The steam and solvent vapors are condensed to liquids. Water insoluble solvents are separated by decantation. Sometimes the vapors are incinerated directly. Many packing type adsorbers have two or more C beds so one bed is in use while the other is regenerating. In the adsorption technique, the pollutant is separated from the exhaust air stream. In some cases, the pollutant is reused, but usually it becomes fuel for incineration. The main advantage of the adsorption technique is that the 30,000 scfm of exhaust air from a paint spray booth is not heated to an elevated temperature. The cleaned unheated air is simply exhausted.

204

59322

APTIC NO. 83469

Cavallaro, J. A., A. W. Deurbrouck, and A. F. Baker

PHYSICAL DESULFURIZATION OF COAL. AICHE Symp. Ser., 70(137):114-122, 1974. 7 refs.

Washability data collected from the processing of over 300 coal samples are presented. Research with both conventional (froth flotation and wet concentrating tables) and unconventional coal preparation equipment (the Hymphreys spiral) indicates that up to 84% of the pyritic sulfur in coal can be removed by physical means. Assuming that a 0.8% total sulfur product is going to be required in conjunction with recently proposed sulfur dioxide emission standards, less than 20% of the Appalachian Region coals and less than 10% of the Midwest Region coals tested can be upgraded to comply even when crushed to 14-mesh top size, assuming that a clean coal yield of only 60% is acceptable. However, if a tail-end process capable of removing 70% of the SO₂ emissions at the power plant is used, permitting the burning of a 3% total sulfur coal, then up to 90% of the Northern Appalachian Region coals tested and up to 80% of the Midwest Region coals tested can be upgraded to meet emission standards after crushing to 1-1/2-inch top size. (Author conclusions modified)

59323

APTIC NO. 72659

Cesselin, P., R. Duhomez, H. Huysman, A. Maubon, and J. Raguin

EXPERIENCE GAINED IN FRANCE IN THE USE OF COMBUSTION-FREE CATCHMENT INSTALLATIONS IN OXYGEN CONVERTER PLANTS (IRSID-CAFL PROCESS).

(Experience acquise en France dans l'exploitation d'installations de captage sans combustion en acierie a l'oxygene (procede IRSID-CAFL)). Text in French. Rev. Met. (Paris), vol.1974:841-858, Nov. 1974. 16 refs. (Presented at the Environmental Control Symposium, Tokyo, Japan, Feb. 18-21, 1974.)

The IRSID-CAFL process for the combustion-free catchment of oxygen converter flue gases and experience gained with such installations in France are described. The flue gases are collected by means of a hood forming a water-jacket and a lower skirt cooled by water spray to minimize the entrainment of false air. The pressure is controlled inside the suction hood, and the formation of explosive mixtures is prevented by a burnt gas plug at the beginning and at the end of the blowing. The flue gas collected is cooled and dust is separated in a humidifier stage and a six-step venturi with low pressure loss, adopting the principle of Wilson's chamber. The dedusted flue gas is discharged into a stack at a constant rate for the incineration of the combustible components, especially carbon monoxide, in a high torch. The flue gas catchment and dedusting installations, now used in many metallurgical plants in France, operate reliably and safely.

59324

APTIC NO. 79293

Cheremisinoff, Paul N. and Richard A. Young

INDUSTRIAL ODOR CONTROL CASE HISTORIES. In: *Industrial Odor Technology Assessment*. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 28, p. 429-442.

Case histories of industrial odor control installations are reviewed. The case histories include: the use of liquid waste incinerator oxidizer systems in combination with refractory-lined packed column scrubbers, the use of afterburners to control odors from animal manure drying operations, the removal of food-processing odors using spray scrubbers, the installation of a wet fume scrubber at a chemical tank truck terminal, the control of rendering plant odors with a combined ventilation-scrubber-neutralizer system, and the use of an impingement tray scrubber to clean industrial sludge incinerator gases.

59325

APTIC NO. 79294

Cheremisinoff, Paul N.

ATMOSPHERIC TRANSPORT, DISPERSION, AND STACK DESIGN CONSIDERATIONS. In: *Industrial Odor Technology Assessment*. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 29, p. 443-456. 23 refs.

Factors affecting the transport and dispersion of odorous air pollutants are reviewed along with some stack design considerations. Topics covered include: the effects of atmospheric turbulence, wind speed and direction, vertical temperature gradient, and atmospheric stability on odor dispersion; different plume types; the effects of topography (natural and man-made); multiple-source emissions; types of emissions and process, sources; plume characteristics; and stack design factors such as actual stack height, gas exit velocity, effective stack height, and stack exit area. A general rule in stack design calls for stacks to be two and a half times higher than the tallest building within 20 stack lengths.

59326

APTIC NO. 81816

Cline, Larry D.

LIMESTONE PLUS POLLUTION EQUALS SOLUTION. *Limestone*, 11(40):20, 48-51, Summer 1974.

The use of limestone processes for the desulfurization of flue gas generated by electric utility operations is discussed, with particular emphasis on the negative attitude of many power companies toward this pollution control technique. The most promising systems to date involve limestone wet scrubbing processes. Objections to this mode of flue gas treatment by electric power companies include sludge disposal problems and additional costs. At the end of 1973, only 22 of nearly 300 electric utilities operating fossil-fueled plants in the United States possessed actual installations or commitments to install at least one full scale flue gas desulfurization system. Environmental Protection Agency estimates of the additional costs associated with the installation of flue gas desulfurization systems amount to about 3% nationwide on the consumer level.

59327

APTIC NO. 83584

Conser, R. E.

HERE'S A NEW WAY TO CLEAN PROCESS GASES. *Oil Gas J.*, 72(13):67-68, 70, April 1, 1974. (Presented at the UOP Technology Conference, 1973.)

An integrated process for the oxidative conversion of sulfide, the UOP Sulfox process is described. Refinery gas streams consisting mainly of hydrogen sulfide, hydrocarbons, hydrogen, inerts, and ammonia are very amenable to Sulfox treatment and produce elemental sulfur in very high yield. The ammonium sulfate loss is equivalent to 0.1 to 0.5% of the S depending on circumstances. The Sulfox process achieves levels of H₂S in the treated gas in the range of 10-100 ppm. Even when the gas is to be burned in the refinery, the 10-100 ppm range for H₂S is adequate to meet proposed regulations on sulfur dioxide content of stack gases. It is possible at increased cost, to design a Sulfox unit to achieve 1 ppm H₂S in the treated gas.

59328

APTIC NO. 83351

Cooper, Raymond Edward

EXHAUST GAS TREATMENT SYSTEM. (*Liberty Industries, Inc., Berlin, Conn.*) U. S. Pat. 3,841,828. 8p., Oct. 15, 1974. 6 refs. (Appl. Feb. 8, 1972, 7 claims).

A system for treating virus contaminated exhaust gas prior to discharge into the atmosphere is described. The system couples high efficiency filtration with in-line combustion to all exhaust gas prior to discharge. The filtration prohibits the passage of exhaust particles larger than about 1/2 micron while the in-line combustion requires dispersed entrainment of all fil-

tered exhaust gas within an elongated flame zone prior to release to the atmosphere. Unlike other systems, this system is economical yet capable of handling high volume exhaust flow from multiple sources without interfering with the effectiveness and efficiency of ambient environmental conditions within the work area. (Author abstract modified)

59329

APTIC NO. 82482

Crow, John H. and John C. Baumann

VERSATILE PROCESS USES SELECTIVE ABSORPTION. *Hydrocarbon Process.*, 53(10):131-132, Oct. 1974.

The Trencor-M selective amine absorptive process using physical equilibrium to desulfurize waste gases is described. Stack gas sulfur contents are reduced to 100-200 ppm. Much lower S contents are obtained by circulating increased volumes of solvent, a proprietary aqueous solution of methyldiethanol amine with small amounts of inorganic salts for buffering, neutralization, and corrosion control. The solvent is highly selective for hydrogen sulfide in streams containing any amount of carbon dioxide, achieving essentially complete H₂S control. The Trencor-M process is applicable for cleaning up any S bearing gas stream, including tail gas from Claus units, waste gas from coal gasification plants, and refinery fuel gas streams.

59330

APTIC NO. 83458

Ctvrtnicek, T. E. and T. W. Hughes

NEW PROCESS FOR SOX ABATEMENT FROM CAT-CRACKER REGENERATOR UNITS. *American Inst. of Chemical Engineers, New York, Dayton and Ohio Valley Sections and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Committee on Energy-Environmental Interactions, Energy Environ. Natl. Conf., 2nd, Oxford, Ohio, 1974, p. 210-213. 2 refs. (Nov. 13-15.)*

The technical and economic feasibility of using secondary steam stripping for reducing sulfur oxide emissions from fluidized catalytic cracking units in refineries are discussed. Increasing the steam stripping rate from the currently used value of 0.5 wt% to 2% results in more than a 90% reduction in sulfur dioxide emissions. This corresponds to a decrease from 2300 ppm SO₂ in the regenerator flue gas to 200 ppm SO₂ for a commercial unit operating on 1.39% sulfur feedstock. Capital and operating costs for this process modification are significantly less than those associated with feedstock desulfurization or tail gas treatment.

59331

APTIC NO. 84330

Daugherty, Kenneth E. and A. O. Wist

AIR POLLUTION CONTROL IN THE CEMENT INDUSTRY. *AICHE Symp. Ser.*, 70(137):50-55, 1974. 28 refs.

The status of pollution control in the portland cement industry is reviewed. Dust control, which is the major problem in the industry, is largely being solved by the use of electrostatic precipitators and baghouses which collect particulates from kiln stacks. Baghouses, although possibly a more positive means of control, are generally more costly to maintain. The recycling of dust through the cement making process is being attempted with varying degrees of success. Sulfur dioxide emissions are not difficult to control since more than 90% of the sulfur in the fuel source is absorbed in the kiln during the production process. Technology for reducing nitrogen oxide emissions from a cement kiln to the 200-300 ppm range does not currently exist. (Author summary modified)

59332

APTIC NO. 72575

Deuster G.

URBAN HEATING AND ENERGY SUPPLY BY MEANS OF REMOTE HEATING PLANTS. (*Staedteheizung und Energieversorgung mittels Fernheizkraftwerken*). Text in German. *Schweiz. Bauztg.*, 92(44):997-1002, 1974. 6 refs.

The need for increasing environmental protection and for optimum use of existing primary energy makes remote heating increasingly more desirable. Industry offers various kinds of heat supply plants. The problem of pollutant emission from conventional fossil fuel-fired heaters is best solved by the use of nuclear energy. Individual domestic heaters replaced by nuclear-powered remote heating plants would help to avoid roughly 2 kg of sulfur dioxide emission per Gcal generated in the nuclear power plant. Individual home heating causes between 75 and 81% of the total SO₂ immission. Some general guidelines for planning remote heating plants are given.

59333

APTIC NO. 83295

Dewey, Ernest A. and Richard F. Clements

ASH REMOVAL SYSTEM FOR INCINERATORS.

(Environmental Control Products Inc., Charlotte, N. C.) U. S. Pat. 3,841,241. 7p., Oct. 15, 1974. 6 refs. (Appl. July 12, 1973, 12 claims).

An ash removal system for incinerators is described which is automatically controlled in response to the feeding of waste material into the incinerator. Prior art systems have either operated on a continuous basis or on an automatic time cycle. In either case, it is difficult to properly adjust the ash removal system to the proper burning cycle so that the ash is removed at the proper rate. This system has a conveyor for automatically removing the burnt material or ash from the ash pit of the incinerator and for transporting it to a remote location. A control is provided for automatically operating the conveyor and a temperature sensing device is located in the ash pit for stopping the conveyor when the accumulation of ash is reduced to a minimum predetermined amount. The conveyor operating cycle is initiated when the incinerator charging door is opened to permit the feeding of the material to be burned from an automatic feed means. (Author abstract modified)

59334

APTIC NO. 83422

Dichev, I., I. Kalev, and V. Yankov

WARRANTY MEASUREMENTS OF THE ELECTROSTATIC PRECIPITATOR STEAM GENERATOR NO. 5 AT THE KREMIKOVTSI HEAT AND ELECTRIC POWER STATION. Text in Russian. *Metalurgiya (Sofia)*, 29(4):9-13, 1974. 3 refs.

A study was conducted in 1969 to determine the efficiency of electrostatic precipitators in heat and electric power plants (HEP). To that end two LUK-type dust precipitators were installed on the no. 5 steam generator at the Kremikovtsi HEP. These precipitators were metal-shell 2-stage horizontal models with a round discharge electrode in the first stage and a star electrode in the second stage. C-type collecting electrodes were 12 m long. Six tests were performed simultaneously at both ends of the precipitators. Despite a very high content of dust in the treated flue gases, the collecting efficiency of the precipitators was excellent (mean 99.76%). At the present time a pneumatic dust conveyor cannot work without impediments, especially in winter. Dust precipitators can operate constantly only when they are serviced regularly. In order to avoid dust accumulation on the walls and ceiling of the dust collecting chamber, the chamber should be air tight.

59335

APTIC NO. 83603

Dieges, Paul Bertrand

VAPORIZATION OF EXHAUST PRODUCTS IN HYDROGEN-OXYGEN ENGINE. (Assignee not given.) U. S. Pat. 3,844,262. 7p., Oct. 29, 1974. 5 refs. (Appl. June 20, 1973, 4 claims).

A new and improved fuel cycle for an internal combustion engine is described which substantially eliminates exhaust pollutants. Hydrogen and oxygen are used as fuel so that water is the only product of combustion. Water is removed by passing the engine exhaust through a condenser and a separator to remove the liquid water from the cooled engine exhaust and then returning the remaining gaseous portion of the mixture to

the intake manifold of the engine. The separated water is warmed to a higher temperature, or may be vaporized, by heat exchange relationship with the engine exhaust before being discharged into the atmosphere. The surplus gas is reused with fresh supplies of H₂ and O₂. Throttle valves are adjusted to vary the quantity of O₂ and H₂ for speed control and at the same time maintain a proper proportioning of the gases at whatever quantity may be established for a selected speed. (Author abstract modified)

59336

APTIC NO. 83268

Douglas, Clarence J., Walter L. Young, and Jack H. Phillips

METHODS AND APPARATUS FOR SUBMERGED COMBUSTION (WITH AIR POLLUTION CONTROL).

(Assignee not given.) U. S. Pat. 3,840,002. 13p., Oct. 8, 1974. 6 refs. (Appl. Aug. 6, 1973, 10 claims).

An important improvement in submerged combustion evaporators and heaters adapted to the heating and evaporation of heat sensitive solutions is given. The discharge of combustion products from the combustion chamber into and through the body of a heat-sensitive solution is handled in such a manner as to reduce air pollution. A submerged combustion burner construction is described which prevents heat sensitive solutions from entering the combustion chamber of the burner or area of highest temperature gases. The decomposition of heat sensitive liquids is minimized by preventing direct contact of hot discharge gases and flame. This prevents loss of valuable materials being concentrated and minimizes air pollution produced by the use of the apparatus and practice of the process. (Author abstract modified)

59337

APTIC NO. 67087

Earl, Christopher B. and Brian H. Potter

THE WELLMAN-LORD SULFUR DIOXIDE RECOVERY PROCESS. Preprint, Wellman-Power Gas, Inc., Lakeland, Fla., 14p., 1974.

The Wellman-Lord sulfur dioxide recovery process has been successful in commercial plants of the U. S. and Japan. Five full-scale installations have now built up an aggregate operating experience of 7 years. The 11 emission sources controlled by the process include sulfuric acid plants, Claus plants, and oil-fired boilers. Since the start-up of the original plant at Paulsboro, N. J., for Olin, the process has demonstrated long-term reliability of operation and its ability to attain SO₂ emission levels for lower than required by the regulatory agencies. The basic Wellman-Lord process is described, and the current status of technology is reviewed. The application to large fossil fuel-fired steam generating plants is reviewed, and capital and operating costs for a specific application are discussed. The Wellman-Lord process is based on a sodium sulfite/bisulfite absorption cycle. (Author abstract modified)

59338

APTIC NO. 80333

Echigodani, Etsuro and Hiroo Niiyama

NOX SEPARATION BY CATALYTIC REACTION. (NOx no sesshoku hanno bunri). Text in Japanese. *Sekiyu Gakkaishi (J. Japan Petroleum Inst. Tokyo)*, 17(5):386-391, May 1974. 46 refs.

Control methods for nitrogen oxides that use catalytic reactions are reviewed. Though extensive studies of the catalytic decomposition of nitric oxide have been done, their practical use is limited because of the low reaction rate of this gas. The catalytic oxidation of NO is more promising, the Esso and Tyco methods are well known for simultaneous removal of NO and sulfur dioxide. Catalytic reduction methods using hydrogen gas, carbon monoxide, ammonia, and hydrogen sulfide as reducing agents have been studied. The method by H₂S is more attractive for simultaneous reduction of SO₂, though further study of the presence of oxygen and water is needed.

59339

APTIC NO. 83273

Ehlen, Jack William

EXHAUST SYSTEM FOR A TWO-CYCLE ENGINE. (McCulloch Corp., Los Angeles, Calif.) U. S. Pat. 3,842,599. 8p., Oct. 22, 1974. 5 refs. (Appl. Dec. 18, 1972, 12 claims).

A compact tuned exhaust system for a two-cycle engine is described. The system simultaneously increases the brake horsepower and decreases the specific fuel consumption over that possible by the utilization of a conventional exhaust system with a two-cycle engine. The potentially audible fluid pulsations emanating from the exhaust system are minimized. The tuning section synergistically acts in concert with an encompassing chamber to attenuate potential audible fluid pulsations within the exhaust gases and fluid pulsations generated by the tuning section structure per se. (Author summary modified)

59340

APTIC NO. 83311

Ehrich, Frederic Franklin

GAS TURBINE ENGINE WITH MEANS FOR REDUCING THE FORMATION AND EMISSION OF NITROGEN OXIDES (General Electric Co., Lynn, Mass.) U. S. Pat. 3,842,597. 7p., Oct. 22, 1974. 4 refs. (Appl. March 16, 1973, 5 claims).

A method for reducing the formation and emission of nitrogen oxides in a gas turbine engine is described. It provides for bleeding and cooling a portion of the airflow pressurized by the compressor. The cooled compressor bleed airflow is introduced into the primary combustion zone of the combustor in order to reduce the flame temperature, affecting a reduction in the rate of formation of oxides of nitrogen. Unlike other methods, this system does not require that water storage tanks and pumps be added to the aircraft which significantly increases the weight of the aircraft. (Author abstract modified)

59341

APTIC NO. 83470

Epstein, M. and F. T. Princiotta

OPERATING EXPERIENCE WITH A PROTOTYPE LIME-LIMESTONE SCRUBBING TEST FACILITY. *AIChE Symp. Ser.*, 70(137):189-211, 1974. 12 refs.

Operating experience with an Environmental Protection Agency prototype lime/limestone scrubbing test facility (30,000 actual cu ft/min) at the Tennessee Valley Authority's Shawnee power plant is described. The facility consists of three parallel scrubber systems: a venturi/after absorber, a turbulent contact absorber, and a marble bed absorber (Hydro-Filter). The sulfur dioxide removal increases significantly with increasing liquor rate for all three systems based on wet limestone scrubbing tests. The SO₂ removal efficiency of the venturi scrubber increases slightly with increasing pressure drop, and the efficiency of the TCA scrubber increases with increasing height of spheres per stage. For the Hydro-Filter scrubber, the SO₂ removal efficiency decreases slightly with increasing gas rate. A major problem at the test facility is demister pluggage. Each scrubber develops a soft mud-like deposit on the demister blades after certain operational periods. Detailed efficiency and reliability data are presented for each scrubber configuration.

59342

APTIC NO. 80246

Fedor, R. J.

APPLICATION OF METALLIC CATALYSTS FOR AUTOMOTIVE NOX CONTROL. Preprint, General Motors Corp., Warren, Mich., Research Labs., 18p., 1974. 3 refs. (Presented at the Catalytic Chemistry on Nitrogen Oxides Symposium, Oct. 7-8, 1974.)

Progress toward developing a practical catalyst for automotive nitrogen oxides control capable of meeting the Japanese NOx requirement is described. Development of a new catalyst system, its adaptation to a prototype small size vehicle, and results of durability tests are presented. The data indicate

compliance with the Japanese 10 mode test standards through the entire 60,000 km road durability test without catalyst replacement or the use of exhaust gas recirculation. The NOx catalyst with an oxygen removal catalyst ahead of it achieved the 1976 Japanese NOx standard. Experience indicates that control of input oxygen is the critical factor controlling the stability of the NOx catalyst. Preliminary data also indicates that the 1978 U. S. NOx standard is obtainable in systems employing exhaust gas recirculation. Application of this concept to full size vehicles is also discussed with respect to both U. S. and Japanese emission standards. (Author abstract modified)

59343

APTIC NO. 79292

Ficek, Kenneth J.

POTASSIUM PERMANGANATE FOR ODOR CONTROL. In: *Industrial Odor Technology Assessment*. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 26, p. 409-417.

The use of the oxidizing agent potassium permanganate as a scrubber additive for odor control is discussed. Industries in which potassium permanganate can be successfully applied to control odors include: rendering, foundry operations, food processing, paint production, chemical manufacturing, and municipal and industrial sewage treatment. Potassium permanganate is not usually successful in operations involving boiler flue gas that contains high concentrations of sulfur dioxide and other waste gases containing nitrogen oxides. Particulates in waste gases must be removed before the gas enters the permanganate scrubber because of their high demand for potassium permanganate. The absorber for odor control must have about a 1-second dwell time for the gases to be transferred to the liquid phase. Many of the reactions with potassium permanganate occur very rapidly; thus, the contact time is required for the absorption rather than the oxidation. A two-stage system is generally more effective than a single-stage system.

59344

APTIC NO. 84334

Fife, J. A.

TECHNIQUES FOR AIR POLLUTION CONTROL IN MUNICIPAL INCINERATION. *AIChE Symp. Ser.*, 70(137):465-473, 1974. 11 refs.

Air pollution control techniques for mixed municipal refuse and municipal sewage sludge incinerators are reviewed. Both electrostatic precipitators and wet scrubbers are applicable to mixed municipal refuse systems, whereas only wet scrubbers can be used for the control of particulates from municipal sewage sludge systems. Bag filters possess a dust removal efficiency comparable to electrostatic precipitators and high energy wet scrubbers but are considered uneconomical and experimental in these applications. Pyrolysis systems emit lower quantities of dry mineral particulate than do conventional stoker-fired municipal incinerators, although their potential for emissions of condensable particulates may be greater than for conventional systems.

59345

APTIC NO. 83460

Finegold, J. and W. Van Vorst

HYDROGEN ENGINE PERFORMANCE. *American Inst. of Chemical Engineers, New York, Dayton and Ohio Valley Sections and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Committee on Energy-Environmental Interactions, Energy Environ. Natl. Conf., 2nd, Oxford, Ohio, 1974, p. 15-20. 4 refs. (Nov. 13-15.)*

Operating efficiency and exhaust emission levels of a 1973 Chevrolet V-8 engine (350 cu in.) modified for hydrogen fuel operation are compared with similar data for the operation of the same engine on gasoline. The engine's operating efficiency with hydrogen fuel is from 25-100% greater than that for gasoline operation. Exhaust emissions with hydrogen fuel are

essentially free of carbon monoxide and unburned hydrocarbons. Nitrogen oxide emissions are reduced from 90-97% when hydrogen fuel is used. Total NOx emissions are below 5 ppm when the engine is operated on hydrogen as compared to 400 ppm for gasoline operation.

59346

APTIC NO. 82545

Fischer, H.

BURNER/FIRE BOX DESIGN IMPROVES SULFUR RECOVERY. *Hydrocarbon Process.*, 53(10):125-130, Oct. 1974.

The effect of burner/fire box design on sulfur recovery in two catalytic stage Claus units is described. Proper design increases recovery of S to a level not normally achieved in three stage units. Proper design eliminates formation of carbon on the catalyst and settling out of ammonium salts when processing sour gases containing ammonia. Above 70% conversion should be attainable based on the H₂S concentration in the sour gas. Maximum conversion rates are attained by mixing the required stoichiometric amount of air with the sour gas before entering the combustion chamber such that the oxygen is bonded just behind the burner mouth. A multi-burner system distributed over the entire cross section of the combustion chamber front wall is very satisfactory for this purpose.

59347

APTIC NO. 84269

Formanek, Josef

PROCESSING OF FLY ASH. (*Uprava elektrearenskych popilku*). Text in Czech. *Sb. Vys. Sk. Chem.-Technol. Praxe, Technol., Vody*, 16(5):59-70, 1974. 8 refs.

Fly ash develops during burning of powdered brown coal and to a lesser degree of powdered hard coal. Its mineralogical composition depends on the quantities of various natural minerals contained in the coal, but the ash also contains a percentage of low-temperature coke. Fly ash has the structure of sand, and is composed of coarse, fine, and powderlike particles. While in the past, fly ashes were utilized as building material only, more recent studies have shown that by conventional methods of flotation and gravitational processing, a carbon concentrate can be obtained from the lighter fraction of the ashes. This concentrate may have a quite substantial calorific value, i.e., as much as 4500 kcal. From the heavy fraction, a ferrous concentrate can be extracted by magnetic separation. About 20 million tons of fly ash per year are generated in the U. S. Enercon Ltd. in Hamilton, Ontario, is processing daily 450 tons of fly ash. From 100,000 tons of fly ash, 9000 tons of high-class ferrous concentrate can be produced.

59348

APTIC NO. 70579

Fukui, J.

SODIUM SULFITE-GYPSUM SO₂ REMOVAL PROCESS IN FLUE GAS DESULFURIZATION. (*Aryuso-sekko ho haien datsuryo sochi*). Text in Japanese. *Kawasaki Giho* (Kawasaki Tech. Rev.), no. 55:62-63, Oct. 1974.

The Kawasaki Heavy Industry Co., Ltd. has developed a new sodium sulfite-gypsum desulfurization technique in cooperation with the Hureha Chemical Industrial Co., Ltd. The first commercial KHI-KUREHA equipment was installed in December 1973 at the Shinsendai Power Station of Tohoku Electric Power Co. and is operating successfully. The new technique involves absorption, regeneration, and oxidation. The sulfur dioxide is absorbed in a column, and the generated sodium hydrosulfite reacts with calcium carbonate to produce calcium sulfite. By adding sulfuric acid, calcium sulfite is converted into calcium sulfate and sodium hydrosulfite. The latter product is reused as the reagent, and calcium sulfate is sent to an oxidation tower in which it is purified to good gypsum after centrifugal separation. Since an alkaline solution is used in the absorption step, the absorption of SO₂ and NaHSO₃ is rapid. The unique absorption tower can treat a large quantity of SO₂

AIR POLLUTION ABSTRACTS, JUNE 1976

gas (420,000N cu m/hr). Because it is a closed system, no waste water is discharged. The desulfurization efficiency is 96% and the production of gypsum is 4.2 tons/hr.

59349

APTIC NO. 84342

Gallagher, P. K., D. W. Johnson, Jr., and F. Schrey

STUDIES OF SOME SUPPORTED PEROVSKITE OXIDATION CATALYSTS. *Mater. Res. Bull.*, 9(10):1345-1352, 1974. 15 refs.

Materials in the nominal system consisting of 1-x moles of lanthanum, x moles of either lead or strontium, 1 mole of manganese, and three moles of oxygen were prepared by a variety of precipitation techniques and were supported on monoliths of cordierite ceramic. Their potential for the catalytic oxidation of carbon monoxide in automotive emissions was examined. Catalyst activity paralleled the surface area for a given composition but was dependent on flow rate. Materials with Sr substitutions were more active than those with lead. With respect to loss of oxygen, manganates (III) were more stable than cobaltates (III), and strontium substitutions led to greater stability than lead substitutions. (Author abstract modified)

59350

APTIC NO. 83604

Garcea, Giampaolo

DEVICE FOR REGULATING THE RATE OF FLOW OF RECYCLED EXHAUST GASES IN AN INTERNAL COMBUSTION ENGINE. (*Alfa-Romeo S.p.A., Milan (Italy)*) U. S. Pat. 3,844, 261. 6p., Oct. 29, 1974. 2 refs. (Appl. Feb. 5, 1973, 7 claims).

A device for regulating the rate of flow of recycled exhaust gases in an internal combustion engine is described. The rate of flow of the recycled gases is in a substantially constant ratio with the rate of flow of the exhaust gases, and with the rate of flow of the gases drawn by the engine. The engine is equipped with an intake duct, an exhaust duct, and an auxiliary piping connected to the exhaust duct to draw a portion of the flowing gases to discharge them into the intake duct. Unlike other devices, this device is capable of sensing the pressure drop of the gases in the exhaust duct. (Author summary modified)

59351

APTIC NO. 76243

Gavrilova, A. A.

KINETICS OF THE REACTION OF GAS CONTAINING HYDROGEN SULFIDE WITH MANGANESE OXIDES. *J. Appl. Chem. USSR (English translation from Russian of: Zh. Prikl. Khim. (Leningrad)*, 47(3):655-656, Sept. 1, 1974.

The kinetics of the reaction of manganese oxides with gas containing hydrogen sulfide was investigated to obtain information on high-temperature processes for the dry removal of H₂S from industrial off gases. Saturation of the reagent with sulfur over a period of time was proportional to the thickness of the sulfide layer formed. When the sulfide layer was sufficiently thin so that no resistance to diffusion of the gas to the solid reagent surface existed, the desulfurization process conformed to the linear equation where the amount of sulfur absorbed (weight fraction) was equal to the product of the temperature proportionality factor and the time. Resistance to diffusion increased with the formation of a manganese sulfide layer, and the process conformed under these conditions to the parabolic equation where the amount of sulfur absorbed to some exponent equalled the product of the temperature proportionality factor and the time. This equation represented the interaction of the H₂S-containing gas with Nikopol manganese ore at 350-550 C in the region of external kinetic control. The apparent activation energy of the reaction was 5080 cal/mole during the initial period and then rose to 14,960 cal/mole. The degree of purification of the gas at a temperature of 500-550 C during the early reaction stages was 84-87%. At higher temperatures of 500-800 C with grade-2 manganese concentrate as

CONTROL METHODS

59357

the reagent, the reaction was first order and was controlled by external diffusion. The degree of H₂S removal was 97-99%, and the degree of utilization of the reagent was 40-50% which is adequate for practical desulfurization.

59352

APTIC NO. 76013

Glazer, F., A. Hershaft, and R. Shaw

EMISSIONS FROM PROCESSES PRODUCING CLEAN FUELS (FINAL REPORT). Booz-Allen and Hamilton, Inc., Bethesda, Md., Office of Air and Waste Management Contract 68-02-1358, Rept. EPA-450/3-75-028, 9075-015, 464p., March 1974. 297 refs.

NTIS: PB 245671/AS

The technical feasibility and costs of installing alternative pollution control systems on clean-fuel processes which are likely to become commercially viable within the next decade are reviewed. The processes analyzed include: the Synthene process (coal to high-Btu gas), the Carbon Dioxide Acceptor process (coal to high-Btu gas), Lurgi process (coal to high- or low Btu gas), the Hygas process (coal to high-Btu gas), the U-Gas process (coal to low-Btu gas), the Koppers-Totzek (coal to low-Btu gas), the Char-Oil-Energy Development (COED) process (coal to oil), the Solvent Refined Coal (SRC) process (coal to coal or oil), the Texaco Partial Oxidation (oil to synthesis gas or hydrogen), and the Gas Combustion Retort process (oil shale to oil). Unit processes appear to exist for providing adequate control of most waste streams from clean-fuel plants, although some pollutants remain difficult to treat. Emissions from clean-fuel processes are generally relatively low in comparison to emissions from alternative uses of the raw fuel. The total costs of pollutant control (1973 basis) for achieving low emissions from high-Btu coal gasification processes range from 15 to 30 cents/million Btu. Low-Btu gasification followed by desulfurization is expected to cost about \$0.65/million Btu of gas produced.

59353

APTIC NO. 83471

Glueck, Alan R.

MOLTEN SALT PROCESSES FOR DESULFURIZATION OF COAL. *AIChE Symp. Ser.*, 70(137):231-236, 1974. 32 refs.

The use of molten salt processes for the desulfurization of stack gas or coal is discussed. Salt melts may be regarded as high temperature analogs of aqueous systems and thus may be employed as solvents for reactants and products, as reagents, or as catalytic agents. Molten systems exhibit excellent heat transfer properties and good thermal stability and may be pumped, filtered, sprayed, or handled in other ways as ordinary liquids. The following possible process configurations for desulfurization via molten salt systems are reviewed: stack gas treatment, coal desulfurization prior to combustion, the conversion of coal to a low-sulfur fluid fuel, the sequestration of sulfur during the burning of coal in a furnace, and the combustion of coal directly in a molten salt reactor. Process flow sheets for each system are provided. (Author abstract modified)

59354

APTIC NO. 83580

Grainger, Lewis M. D.

ANTI-POLLUTION FUEL SYSTEM. (Assignee not given.) U. S. Pat. 3,844,264. 5p., Oct. 29, 1974. 3 refs. (Appl. Nov. 9, 1972, 1 claim).

An anti-pollution fuel system for use with an internal combustion engine is described. The fuel system is completely sealed to prevent the escape of evaporative vapors. An expansion tank is located in the sealed system to accept over-flow expansion of vapors and/or fuel from the fuel tank. Liquid in the expansion tank is returned to the fuel tank as pressure is reduced. The gas tank cap is sealed to prevent the flow of expanding gases and has a one-way valve to admit air as the fuel is used from the fuel tank. A magnetic valve in the fuel line between the fuel tank and the fuel pump is automatically

closed except when the ignition key is in the on position. It then opens to permit the flow of fuel to the fuel pump. (Author abstract modified)

59355

APTIC NO. 72598

Hagey, Graham and Andrew J. Parker, Jr.

TECHNICAL AND ECONOMIC CRITERIA FOR THE SELECTION OF ALTERNATIVE FUELS FOR PERSONAL AUTOMOTIVE TRANSPORTATION. Preprint, 11p., 1974. 2 refs. (Presented at the Intersociety Energy Conversion Engineering Conference Proceedings, 9th, San Francisco, Calif., Aug. 1974, Paper 749163.)

Economically and technically feasible alternative automotive fuels (i.e., non-petroleum fuels) are identified for the time frame of 1985-2000. The most promising alternatives to petroleum fuels are synthetic gasoline and hydrocarbon distillates. Methanol is the next most attractive fuel and could be used as a blending additive or extender for conventional or synthetic gasoline. Pure methanol will not be available in sufficient quantities before the year 2000 to permit its widespread use. Hydrogen is a speculative fuel which may become more attractive in the post 2000 time period as fossil carbon resources are depleted. Shale-derived fuels are projected to be less expensive than coal-derived fuels over the entire time frame, though the qualitative development of shale oil will probably be limited environmentally and by other resources rather than by experiments and potential demand. (Author conclusions modified)

59356

APTIC NO. 83326

Hansford, Rowland C.

EXHAUST GAS CONVERSION PROCESS AND CATALYST. (Union Oil Co., of Calif., Los Angeles) U. S. Pat. 3,842,158. 3p., Oct. 15, 1974. 5 refs. (Appl. April 20, 1972, 3 claims).

A process and catalyst for the catalytic conversion of nitrogen oxides, unburned hydrocarbons, and carbon monoxide in internal combustion engine exhaust gases are described. The catalyst comprises essentially a composite of copper oxide and cobalt oxide wherein the weight ratio of CuO/Co₂O₃ is between about 1/8 and 2/1. Unlike other catalysts, this catalyst gives an unusually selective conversion of nitrogen oxides to elemental nitrogen instead of to ammonia. (Author abstract modified)

59357

APTIC NO. 76462

Harrison, D.

SULPHUR DIOXIDE REMOVAL SYSTEMS RELATED TO ONTARIO HYDRO. Ontario Hydro, Toronto (Canada), Ontario Ind. Waste Conf. Proc., Canada, 1974, p. 119-132. 15 refs.

Some sulfur dioxide removal processes under development are described. These include all limestone slurry process, the lime process, the magnesium oxide process, the sodium process, catalytic oxidation, and the activated carbon process. The limestone slurry process was selected for use. Preliminary laboratory work indicates that recycling the sludge produced by this process is feasible. Research has also been done on two regenerative sulfur dioxide removal systems: the potassium process and the copper oxide process. The cost of modifying existing structures varies widely. The estimated cost for a 500 MW limestone slurry scrubber on a Tennessee Valley Authority power plant is \$80/kilowatt. Adding scrubbers to control SO₂ emissions will probably add approximately 40% to the cost of a fossil fuel fired generating station. Extensive research and development, together with the installation and operation of large scale plants has brought about rapid technological advance in flue gas desulfurization systems for application to large electric power plants.

59358

APTIC NO. 83590

Hausberg, Gerhard and Karl Rudolf Hegemann

SYSTEM FOR DISCHARGING FLUE GASES. (Gottfried Bischoff Bau Kompl. Gasreinigungs- und Wasserrückkühlanlagen Kommanditgesellschaft, Essen (Federal Republic of Germany)) U. S. Pat. 3,844,744. 6p., Oct. 29, 1974. 7 refs. (Appl. March 16, 1972, 13 claims).

An apparatus for the removal of high pressure waste gases and particulates from blast furnaces is described. An improved nozzle construction was developed which positively maintains a substantially invariable minimal flow resistance so as to throttle the gas flow even under conditions of abnormally low input pressure. This dispenses with the need for a special control circuit required in the prior art.

59359

APTIC NO. 81800

Heck, Roland H., James Wei, and James R. Katzer

THE TRANSIENT RESPONSE OF A MONOLITHIC CATALYST REPORT. *Advan. Chem. Ser.*, no. 133:34-45, 1974. 18 refs. (Presented at the American Chemical Society, American Institute of Chemical Engineers, Canadian Society for Chemical Engineering and European Federation of Chemical Engineering International Symposium on Chemical Reaction Engineering, 3rd, Evanston, Ill., Aug. 27-29, 1974.)

The transient response of an automotive monolithic catalyst support equipped with thermocouples was investigated in a wind tunnel constructed to generate an air flow at a temperature of 650 F. The temperature in the monolith was measured as a function of position and time. The thermocouples measured a temperature which was closer to the gas temperature than the solid temperature. Onsager's approximate solution was found to agree with the analytical solution of Schumann and described the transient temperature profiles. Experimental values of the average Nusselt number lay between the theoretical values based on constant wall temperature and those based on constant wall flux. There was a short entrance region where the local Nusselt number was higher. (Author abstract modified)

59360

APTIC NO. 76471

Heidelberger, William

INCINERATION SYSTEMS FOR THE DISPOSAL OF EXPLOSIVE AND PROPELLANT WASTE MATERIALS. *Purdue Univ., Lafayette, Ind., Ind. Waste Conf. Proc.*, 29th, Lafayette, Ind., 1974, p. 662-668. 2 refs. (May 7-9.)

The reduction of nitrogen oxides in a fluidized bed incineration system for the disposal of explosive and propellant waste materials is described. Nitric oxide-NOx are reduced by 50% when a two-stage combustion technique is used. The stoichiometric balance of 63% primary air and 57% secondary air is very near optimum. Deviation from this ratio leads to almost instantaneous upward excursions for the NO-NOx concentrations while a return to the original balance always brings NO-NOx concentrations to minimum levels. The introduction of a catalyst in the single stage mode has a detrimental effect on NO-NOx emissions. When a catalyst is used in conjunction with two-stage burning, there is a starting reduction in NO-NOx, carbon monoxide, and hydrocarbon concentrations. Successful development of the two-stage catalytic concept could preclude the necessity for air pollution abatement equipment and eliminate the liquid disposal problems in scrubbing operations.

59361

APTIC NO. 70202

Henderson, James M. and John B. Pfeiffer

LIQUID SO₂ FROM COPPER CONVERTER GASES THE ASARCO DIMETHYLANILINE PROCESS. *Preprint, American Inst. of Chemical Engineers, New York*, 15p., 1974. (Presented at the American Institute of Chemical Engineers, National Meeting, 78th, Salt Lake City, Utah, Aug. 18-21, 1974.)

The production of liquid sulfur dioxide from copper converter gases at the American Smelting and Refining Co. (ASARCO) smelter in Tacoma, Wash. is described. Total recovery of sulfur from the facility either as liquid SO₂ or sulfuric acid amounts to 51% of smelter input and enables the plant to comply with all existing ambient air standards for SO₂. The SO₂ is absorbed in dimethylaniline and the SO₂ is stripped from the loaded absorbent. Absorbent loading varies from 140 to 160 g of SO₂/l. The dimethylaniline vapor is recovered both from the SO₂ impoverished smelter gas stream and the concentrated SO₂ leaving the stripper. The concentration of SO₂ is dried, compressed, and condensed to form a high purity liquid product that contains under 50 ppm of both water and nonvolatile residue. (Author abstract modified)

59362

APTIC NO. 83594

Henderson, James M. and John B. Pfeiffer

HOW ASARCO LIQUIFIES SO₂ OFF-GAS AT TACOMA SMELTER. *Mining Engineering*, 26(11):36-38, Nov. 1974.

The operation of the liquid sulfur dioxide plant at the American Smelting and Refining Co. Tacoma copper smelter is discussed. Sulfur dioxide gas from the rectifier, free of dimethylaniline (DMA) vapor, passes through a two-stage drying tower against a flow of concentrated sulfuric acid. The dehydrated SO₂ is compressed to 80 psi. Upon cooling, it is liquefied and pumped to storage. Most of the spent acid from the drying tower is diluted for use in the acid scrubber, the upper section of the absorption tower, while the balance is returned to the acid plant for further fortification. Liquid SO₂ produced by this DMA process is a high-quality product which typically contains well under 50 ppm of both water and non-volatile residue.

59363

APTIC NO. 70555

Henderson, James N.

ENVIRONMENTAL OVERKILL--THE NATURAL RESOURCE IMPACT. *Mining Congr. J.*, 60(12):18-23, Dec. 1974.

The consequences of sulfur dioxide controls are discussed which can lead to debasements of the environment and be wasteful of energy and other natural resources. The Environmental Protection Agency has apparently concluded that there is a limit on SO₂ control costs of 3 cents/lb of copper which can be considered reasonable for domestic primary copper smelting. Treatment of the large volumes of relatively dilute reverberatory furnace gases generated in the typical copper smelter is thus not economically feasible, even if a number of developing techniques for recovery of SO₂ or sulfuric acid from such dilute gas streams were fully developed. A new source performance standard has been provisionally proposed which in effect will prohibit use of reverberatory furnaces in copper smelters of the future. This proposal is justified on the basis that large-scale hydrometallurgical processing of copper concentrates is a potentially promising substitute for pyrometallurgical treatment of copper-bearing materials and that flash smelting and electric furnaces are proven alternatives to the reverberatory furnace. However, this justification is not necessarily correct. Flash smelting is not a universally acceptable reverberatory furnace substitute. By forcing flash smelting as an alternative to the reverberatory furnace, the new source performance standard would restrict disposal of abatement-derived H₂SO₄ in a way which at the same time contributes to continuing needs for copper. Experience with large electric furnaces is limited, and the new standard would require that copper concentrates of high volatile impurity content, lead smelter by-products, and, to a certain extent, cement copper very largely must be smelted in electric furnaces. The increased use of electric furnaces would increase electric power use and mining of coal to fuel power stations. The energy requirements for smelting and refining copper are reviewed; electric furnaces would require the highest energy consumption, and calcine charged reverberatory furnaces would have an energy advantage. Most hydrometallurgical processes are

energy intensive. Thus, the proposed EPA standard conflicts with energy conservation. An intermittent control system should be used which encourages recovery of sulfur from the waste gas streams in a useful form.

59364

APTIC NO. 79184

Hendrickson, E. R.

RECENT TRENDS IN ODOR CONTROL FROM KRAFT PULP MILLS. In: *Air Pollution Control and Industrial Energy Production*. Kenneth E. Noll, Wayne T. Davis, and Joseph R. Duncan (eds.), Ann Arbor, Mich., Ann Arbor Science, 1974 (?), Chapt. 15, p. 235-246. 2 refs.

The kraft pulping process is described. The characteristic kraft mill odor is principally due to the presence of a variable mixture of hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide, all of which are total reduced sulfur (TRS) compounds. The principal potential contributors of TRS in the kraft process are the recovery furnace in combination with the direct contact evaporators, digester relief and blow, multiple effect evaporators, smelt tank, brown stock washers, and lime kiln. Several control methods for the reduction of odorous emissions from each source are listed. Each alternative is not an acceptable solution for all locations and all are not equally effective. Also, the selection of a certain alternative for some source may eliminate the need for application of any control technique on another source. An alternative or level of performance applicable to the original design of a new mill may be extremely difficult or impossible to achieve in an existing installation. Application of the best available technology for control of odorous emissions on the original design of a new kraft mill can result in substantial reductions. Less spectacular results usually are achieved in existing mills.

59365

APTIC NO. 82479

Herr, Elmer and Raymond L. Poltorak

PROGRAM GOAL—NO PLANT ODORS. *Water Sewage Works*, 121(10): 56-58, Oct. 1974.

The control of odors associated with sewage collection, transport, and treatment is discussed. The capability of activated carbon to remove hydrogen sulfide and organic compounds typically associated with sewage odors makes it a useful tool in sewage systems odor control. Whether used in conjunction with other methods, such as scrubbers, or used alone, activated carbon's long life in these systems and its ability to be regenerated for reuse provides for effective and economical systems. It is possible to build sewage treatment plants closer to residential areas. Odor problems and their control at the Sacramento Main Waste Water Treatment Plant are described.

59366

APTIC NO. 79283

Herr, George A.

ODOR CONTROL IN THE PHARMACEUTICAL INDUSTRY. In: *Industrial Odor Technology Assessment*. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 11, p. 175-187.

Methods of controlling odors generated by the pharmaceutical industry are reviewed. Typical odorous components of such emissions include: organic acids, mercaptans, amines, aldehydes, and organic wastes. Control methods used in the industry include: process modification, dispersion, masking, chemical reaction (scrubbing), flame and catalytic oxidation, and adsorption. Chemical reaction is most widely used in containing odors from organic chemical synthesis. Adsorption is most often used in dealing with odors that are contained in large volumes of fairly dry air. Thermal oxidation is most commonly used to incinerate fermentation or waste treatment odors. Masking techniques are frequently employed because capital costs for equipment are low. Process modification is not widely practiced in the pharmaceutical industry.

59367

APTIC NO. 83327

Herrbrich, Bernd

CONTROL DEVICE FOR A CLEANING INSTALLATION INSERTED INTO THE EXHAUST GAS SYSTEM. (Dr. Ing. H.c.F. Porsche KG, Stuttgart-Zuffenhausen (Federal Republic of Germany)) U. S. Pat. 3,844,119. 5p., Oct. 29, 1974. 6 refs. (Appl. July 27, 1972, 12 claims).

A control device for a cleaning installation which is interconnected in the exhaust gas system of an internal combustion engine is described. It absorbs the harmful substances of the exhaust gases. The device controls the through flow of the exhaust gases through the cleaning installation as a function of the operating conditions of the engine using a flow controlled exhaust gas conduit system. This flow system is arranged between an exhaust gas manifold and a catalyst serving as cleaning installation and is itself controlled automatically by the flow resistance of the catalyst and exhaust gas channels of different cross sections and/or configurations interconnected in the exhaust gas conduit system. Unlike other devices, this device is able to get along without mechanically actuated or mechanically movable parts. It requires no service and is reliable. (Author abstract modified)

59368

APTIC NO. 84324

Hesketh, Howard E.

SCRUBBING WITH AN IMPINGER REACTOR. *American Inst. of Chemical Engineers, New York, Dayton and Ohio Valley Sections and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Committee on Energy-Environmental Interactions, Energy Environ., Natl. Conf. 2nd, Oxford, Ohio, 1974, p. 174-176. (Nov. 13-15.)*

Operating and performance data for two types of impingers, the Pentapure and Polypure, used for the wet scrubbing of particulate matter are provided. The liquid to gas ratio requirement for these scrubbing devices is about 1.5 gal/1000 standard dry cu ft of gas per stage per systems that do not require gas conditioning. The Polypure impinger can be conveniently stacked to provide a number of scrubbing stages in series. Pressure drops in these devices are about 3.5 in. of water for the first stage, with multiple stages requiring somewhat less than multiples of the basic pressure drop. Particle collection efficiencies as high as 99.7% are reported for single stage systems. Impinger systems in some applications are operating with essentially 100% availability. Operating expenses are significantly reduced as a result of the lower pressure drops associated with impingers. (Author abstract modified)

59369

APTIC NO. 79747

Hews, C. F. and J. G. Rutherford

ENVIRONMENTAL CONTROL AT UNDERGROUND DIESEL OPERATIONS. In: *Proceedings of the Symposium on the Use of Diesel-Powered Equipment in Underground Mining*, Pittsburgh, Pa., Jan. 30-31, 1973. Bureau of Mines, Information Circ., no. 8666:342-358, 1974.

A program for the successful use of diesel powered equipment in underground mining operations was developed. It includes the following factors: the choice of clean burning diesel engines using premium grade fuel, to minimize the toxic fumes produced; the use of oxycatalytic exhaust scrubbers to eliminate most of the toxic gases in the engine exhaust and the odors normally associated with diesel engines; proper maintenance of engines, air intake filters, and exhaust scrubbers; adequate ventilation throughout all sections of the diesel operating areas; and daily checks on atmospheric conditions at each diesel haulage unit, in addition to the complete weekly tests required by the Mines Branch at all diesels. (Author conclusions modified)

59370

APTIC NO. 84436

Higley, L. W. and H. H. Fukubayashi

METHOD FOR RECOVERY OF ZINC AND LEAD FROM ELECTRIC FURNACE STEELMAKING DUSTS. Bu-

reau of Mines, Washington, D. C. and IIT Research Inst., Chicago, Ill., *Mineral Waste Util. Symp. Proc. 4th*, Chicago, Ill., 1974, p. 295-302. 7 refs. (May 7-8.)

A roast reduction method for recovering practically all the zinc and a portion of the lead from electric furnace steelmaking dust was developed. The zinc oxide is reduced to Zn metal with carbon, in the form of charcoal or coke breeze. A primary requirement is that no air be permitted to enter the system. Since the material is processed in a closed system, and the principal offgas, carbon monoxide, is burned, the method is essentially non-polluting. (Author conclusions modified)

59371

APTIC NO. 83675

Hirako, Yoshio and Katsumi Kataoka

IMPROVEMENT OF COMBUSTION AND EMISSION CONTROL BY STRATIFIED CHARGE IN A TWO-CYCLE SPARK IGNITION ENGINE: 4TH REPORT.

(Sojo kyuki ni yoru 2-saikuru gasorin kikan no nensho kazen oyobi haiki gasu no seijoka ni kansuru kenkyu: Dai 4-ho). Text in Japanese. *Nippon Jidosha Kenkyujo Kenkyu Sokuho* (Res. Lett. Japan Automob. Inst.), no. 30:63-71, Sept. 1974. 6 refs.

A mathematical model was developed to predict nitric oxide emissions for the combustion cycle involving two combustion chambers (main and pre-combustion), in a 2-cycle gasoline engine. Because scavenging action occurs in 2-cycle engines, it is difficult to determine initial conditions of the combustion cycle. However, by postulating initial conditions, it is possible to predict, qualitatively, influences that driving conditions and changes in the progress of combustion have on NO emission. When calculations were made for actual engines (carburetor type, 63.8-cc; pre-chamber type, 40-cc), NO concentration from the pre-chamber type engine was 1/10 of that from the carburetor type engine.

59372

APTIC NO. 81774

Holzapfel, G. L. and J. D. Pinkerton

STATUS OF EMISSIONS FROM LPG-FUELED ENGINES. PART I: EFFECTS OF FUEL MIXTURE AND DISTRIBUTION. Butane-Propane News, 6(1):24-26, Jan. 1974.

The effects of fuel mixture and distribution on the performance and exhaust emissions of liquid petroleum-fueled automobile engines are discussed. Multicylinder engine tests using propane as the fuel indicate that as the fuel mixture is leaned out to an air-fuel ratio of greater than 18:1 on full throttle the carbon monoxide emissions are negligible and hydrocarbons reach very low levels. Nitric oxide emissions reach their maximum at about 10% excess air (air-fuel ratio of 17.3:1) and decrease as the fuel mixture becomes either richer or leaner. Data indicating that maximum power is achieved at rich mixtures is shown to be in error as a result of bad fuel distribution problems in the intake manifold.

59373

APTIC NO. 76472

Huber, Carl V. and Gordon E. Jones

COMBINED TREATMENT OF LEATHER TANNING AND MUNICIPAL WASTES AT GRAND HAVEN, MICHIGAN. Purdue Univ., Lafayette, Ind., *Ind. Waste Conf. Proc.*, 29th, Lafayette, Ind., 1974, p. 608-616. (May 7-9.)

The odor control system at a wastewater facility treating leather tanning and municipal wastes in Grand Haven, Mich. is described. All odor producing areas, namely the grit and screen building, sludge thickener tanks, decant tank, and vacuum filters, are covered and vented. Odors drawn from the various areas are ducted to the incinerator area for destruction. The air volume vented is either used as combustion air for the incinerator or passes through an ozonation system and ozone contact chamber for oxidation. When all areas are vented simultaneously the incinerator handles a certain portion with the remaining gas volume oxidized through the use of O₃.

Manometers installed at various places in the odor control system enable the operation to determine the proper split and amount of O₃ necessary to oxidize the odor producing elements.

59374

APTIC NO. 83323

Hundhausen, Eckhard, Claus Christian Cobarg, and Hans-Georg Boehm

ELECTROSTATIC FILTER. (Assignee not given.) U. S. Pat. 3,841,840, 6p., Oct. 15, 1974. 4 refs. (Appl. July 27, 1972, 8 claims).

An electrostatic filter for use in an air cleaning appliance suitable for residential as well as industrial premises is described. It has electrodes separated by a substance which permanently adsorbs or absorbs the particles carried by the air, or converts them into innocuous compounds by a chemical transformation or reaction. This prevents the particles from being returned to the ambient air when the appliance is switched off. Suitable substances include activated carbon, kieselguhr zollite, gells, or an oxidizing or reducing agent. Unlike other filters, this filter is designed so that molecules of organic compounds which have been separated out either cannot re-evaporate from the filter electrodes or can do so only in an innocuous form. (Author abstract modified)

59375

APTIC NO. 81833

Hurn, R. W., B. H. Eccleston, and D. B. Eccleston

FUEL VOLATILITY AS AN ADJUNCT TO AUTO EMISSION CONTROL. Am. Chem. Soc. Symp. Ser., vol. 1974:60-68, 1974.

The effects of fuel volatility on automotive exhaust emissions were studied using 12 test fuels with different volatility characteristics and three test vehicles ranging from a compact model to an intermediate sedan with a 350 cu in. engine. The volatility characteristics of the test fuels ranged between 7 and 14 lb Reid vapor pressure, 50% point between 130 and 240 F, and 90% point between 190 and 370 F. Choke settings of each vehicle were adjusted as needed for choke action appropriate to each fuel's volatility. Midrange and back-end volatility influenced exhaust emissions in an interacting fashion, with the principal influence being on emissions during cold start and warmup. Vapor pressure and fuel front-end volatility only slightly affected emissions within the vapor pressure limits traditional for American fuels. Reduced hydrocarbon and carbon monoxide emissions were associated with fuels of lower back-end volatility. Nitrogen oxide emissions increased with fuels of lower volatility, probably as a result of the stoichiometry of the air-fuel mixture and the heat content of the fuel. Emissions reduction appeared to be best served by the incorporation of high mid-range volatility into the fuel. (Author abstract modified)

59376

APTIC NO. 83575

Hyde, Paul E.

APPLICATION AND DESIGN CRITERIA FOR BURNING FUMES IN BOILERS. Plant Eng., 28(21):135-137, Oct. 17, 1974.

The use of fume incineration in eliminating disagreeable odors and meeting air pollution control requirements is discussed. Fumes to be burned should be completely combustible and not corrosive or explosive. They need sufficient oxygen to supply combustion air for the boiler. Dust collecting equipment is added to the exhaust system if noncombustible particles are present. Velocities high enough to prevent the particles from depositing on the tubes are maintained, but are not so high as to cause abrasive wear. Corrosive fumes, such as hydrogen chloride, should be avoided since they attack combustion controls, boiler tubes, and the exhaust system. Fumes should not exceed one-third of the lower explosive limit established by the National Fire Protection Association's Oven and Furnace Code, which requires at least 10,000 standard cu ft of air/gal of solvent evaporated in an oven. Odorous fumes from

packing plants, linseed oil fumes from hardboard tempering ovens, phenolformaldehyde fumes from impregnating lines, oil mists and vapors, and veneer dryer emissions can be burned.

59377

APTIC NO. 67128

Inverardi, R.

CHARACTERISTICS OF THE PAPER INDUSTRY POLLUTION CONTROL. (*Caratteristiche dell'industria cartaria e lotta contro l'inquinamento*). Text in Italian. *Cellul. Carta*, 25(1):41-48, 1974. (Relazione svolta della Tavola Rotonda su La cellulosa: problema economico ed ecologico nazionale, Milano, Italy, 10 Ottobre 1973.)

An overview of the Italian paper industry's attempts to uphold ecological standards is presented. The paper industry does not cause insoluble pollution problems since there are effective ways to eliminate harmful residues by modifying production processes and recycling and purifying the waters used in paper production. Paper products are all biodegradable and can be reused. The Italian paper industry seeks harmony with the environment, especially in terms of reforestation.

59378

APTIC NO. 78611

Jenson, George A.

DEVELOPMENT OF A PROCESS FOR PRODUCING AN ASHLESS LOW-SULFUR FUEL FROM COAL -- VOLUME IV -- PRODUCT STUDIES -- PART 5 -- DEVELOPMENTAL AND RATE STUDIES IN PROCESSING COAL MINERALS (INTERIM REPORT).

The Pittsburg and Midway Coal Mining Co., Kansas City, Mo., Office of Coal Research Contract 14-01-0001-496, Rept. OCR/R and D 53/Int. 13, 139p., Nov. 1974. 73 refs.

NTIS: PB 237 766

The chemical reactions and kinetics of carbon removal and iron reduction from coal minerals were studied. Literature pertaining to coal and some of the relevant inorganic substances contained in the coal matrix, including glass, mineral wool, sulfur, iron, and carbon, is reviewed. Theoretical considerations are discussed, including chemical reactions and thermal and kinetic considerations. The fluid bed reactor used in the experiments is described. Carbon in the coal minerals was reacted with water between 1900 F and 2600 F to produce synthesis gas (carbon monoxide + hydrogen). Analysis of the gases produced by reaction of coal minerals was by gas chromatography. The carbon steam reaction and iron reduction in coal minerals are discussed. The carbon in coal minerals can be successfully gasified with steam to produce carbon monoxide and hydrogen for use as a fuel gas. The reaction temperature should be controlled between 2000 F and 2200 F to minimize carbon dioxide formation and melting of the coal mineral. The reaction for fuel or synthesis gas production is a relatively slow, reaction-rate controlled process, independent of particle size, and can be approximated by shrinking core models. Elemental iron is produced within the coal mineral particles during the gasification process, probably by reaction with the hydrogen made available by the steam-carbon reaction. This latter process is intermediate between diffusion controlling and rate controlling. Nearly quantitative recovery of the iron can be obtained from the mineral residues of coal mineral gasification by proper addition of a flux.

59379

APTIC NO. 84344

Johnson, D. W., Jr., P. K. Gallagher, E. M. Vogel, and F. Schrey

EFFECTS OF SO₂ UPON THE CATALYTIC ACTIVITY OF PT DOPED OXIDATION CATALYSTS BY DTA.

Preprint, Bell Labs., Murray Hill, N. J., 17p., 1974. 10 refs. (Presented at the Thermal Analysis, 4th International Conference, Budapest, Hungary, July 1974.)

Differential thermal analysis is used to demonstrate the catalytic activity of manganites for the oxidation of carbon monoxide and ethane. The catalytic activity of these materials is greatly reduced when sulfur dioxide is added to the test at-

mosphere. The doping of polycrystalline samples with as little as 200 ppm of platinum, however, is effective in making the catalyst materials resistant to SO₂ poisoning. The activity of these catalyst materials towards the oxidation of CO in the absence of SO₂ is not affected by the platinum content. (Author abstract modified)

59380

APTIC NO. 83660

Johnston, John W.

ODOUR AND FUME CONTROL BY WET SCRUBBING PROCESSES. *Chem. Ind. (London)*, no. 21:849-853, Nov. 2, 1974.

The use of wet scrubbing processes for odor and fume control is discussed. Wet scrubbing of gases and fumes is achieved by equipment in which one or more of the following processes can take place: physical collection, absorption, chemical reaction, condensation, and masking. Wet scrubbers are designed to utilize these processes and fall basically into two categories, those in which the scrubbing liquor is in the form of a spray and those incorporating internal packings or plates, thus presenting a large liquid surface area for gas absorption and impingement targets for dust and fume arresting. Wet scrubbers are used extensively for the absorption of gaseous and odorous vapors from air and exhaust gas streams. In considering the type of unit to be used for such applications, the main criterion is for good gas/liquid contact.

59381

APTIC NO. 83624

Kaercher, L. T. and J. D. Sensenbaugh

AIR POLLUTION CONTROL FOR AN ELECTRIC FURNACE MELT SHOP. *Iron Steel Engr.*, 51(5):47-51, May 1974.

An air pollution control system for an electric furnace melt shop is described. A baghouse is used for total building evacuation. The dust handling system for each baghouse conveys collected dust from the hoppers to a central point. This system consists of ribbon flight conveyors, cascaded to avoid the use of internal bearings. In designing the conveyor system, components are duplicated as much as possible to reduce spare parts inventory requirements. The baghouses collect about 12 lb of dust/ton of steel melted. The dust composition is principally iron oxide (52.7%), calcium oxide, (13.6%) and magnesium oxide, (12.6%).

59382

APTIC NO. 83474

Kalen, B. and F. A. Zenz

THEORETICAL-EMPIRICAL APPROACH TO SALTA-TION VELOCITY IN CYCLONE DESIGN. *AICHE Symp. Ser.*, 70(137):388-396, 1974. 9 refs.

Laboratory test results and theoretical conclusions concerning factors affecting the particulate collection efficiency of industrial cyclones are presented. The spiraling gas-solids inlet stream, conceivably viewed as a coiled pipe, may also be regarded as an uncoiled horizontal pipe conveying acceleration-field-weighted solids from one end to the other. Although the particles encounter conventional vertical fall drag forces in settling to the bottom of the pipe, they can only accomplish this fall if the superficial velocity in the pipe is below their saltation velocity. Thus, if the spiraling velocity exceeds the saltation velocity, then collection efficiency is reduced. A design procedure for maximizing collection efficiency for any combination of process conditions is outlined. (Author abstract modified)

59383

APTIC NO. 84402

Katzman, Howard, Louis Pandolfi, Lee Anne Pedersen, and W. F. Libby

LEAD TOLERANT AUTO EXHAUST CATALYST.

Preprint, California Catalysis Society, 11p., 1974. 4 refs. (Presented at the California Catalysis Society Fall Meeting, Anaheim, Nov. 1-2, 1974.)

The rare earth cobalt oxide perovskites were investigated for use in a lead-tolerant auto exhaust catalyst. The perovskites were not poisoned by lead tetraethyl or lead dibromide, or ethylene dibromide. They retained their activity after exposure to high temperature surges simulating backfires. It was possible to use undoped material. The surface area was increased by acid etching.

59384

APTIC NO. 70216

Kett, Terence K., Gerard C. Lahn, and William L. Schuette
FLEXICOKING. A VERSATILE RESIDUUM CONVERSION PROCESS. Preprint, American Inst. of Chemical Engineers, New York, 23p., 1974. 5 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, Washington, D. C., Dec. 2, 1974.)

Flexicoking is Exxon Research and Engineering Company's versatile residuum conversion process which is an extension of the well-proven Fluid Coking process which has been in commercial operation since 1954. The new feature of Flexicoking is the addition of a coke gasifier for converting the coke formed into a clean, low-sulfur gaseous product. Overall, the process can convert about 99% of a typical vacuum residuum into more valuable liquid and gaseous products. The remaining 1% consists of low-sulfur coke purge containing essentially all of the feed metals. A process description of Flexicoking is given, and initial results from the Flexicoker prototype unit are presented. The role of Flexicoking in upgrading low value crudes into clean products to help meet future energy needs and in contributing to a cleaner environment is discussed. Yield and costs information are presented for widely different feeds. (Author introduction modified)

59385

APTIC NO. 73324

Knop, Wilhelm

REDUCTION OF ODORS CAUSED BY ANIMAL FLAYING STATIONS. (*Verminderung der durch Tierkoerperverwertungsanstalten verursachten Geruchsbelastigung*). Text in German. Wasser Luft Betrieb, 18(11):598-605, 1974. 34 refs.

In animal flaying stations odors develop at the depressurizing of the cooker, at drying processes, at the opening and filling of the cooker, as well as at the emptying of the cooker. In addition, odors are emitted by the developing condensation water, by the fat pressing station, and by the meat meal storage bunker. The wet processes employed for the removal of these odors use chemical absorption rather than scrubbing with water since most of the odorous substances involved are poorly soluble in water. The scrubbers preferred for this purpose are the tower scrubber, the jet gas scrubber, and the venturi scrubber. As oxidizing agents, chlorine or chlorine dioxide are preferably used. The tower scrubber is usually packed with limestone, dolomite, or other alkali earth carbonates. The jet gas scrubber by Koerting operates in three stages, the first stage uses fresh water, the second a chlorine or chlorine dioxide solution, and the third stage again water which contains no more chemicals at the exit and thus is returned to the first stage. The Steuler-Solvoxon method uses two scrubbing fluids, e.g., an acid and a lye. A separation of the two washing cycles is achieved by capillary floors arranged in one tower. Other successful methods of odor removal are thermal and catalytic afterburning. A brief review of these methods is given. Biological methods, such as bacteria living in filter mats through which the odorous air is passed, did not operate satisfactorily in animal flaying stations because it was not feasible to maintain suitable living conditions for the bacteria within the filter. In an animal flaying station in Hesse the odorous air is cleaned by passing it to a multi-stage water purification plant where the gases are cleaned together with the waste water. Promising methods of odor removal are the Adsox and the potassium permanganate scrubbing processes. The Adsox process first concentrates the odorous substances by passing the gas through activated coal. A small gas flow is highly loaded with odorous substance and then burned in a thermal afterburner.

214

The major part of the gas leaves the activated coal free of odor. The potassium permanganate scrubbing process uses aqueous potassium permanganate with several additions. The optimum operating temperature was 30 to 40 C, the contact time 3 or 2 seconds.

59386

APTIC NO. 67079

Kobylnski, T. P., B. W. Taylor, and J. E. Young

STABILIZED RUTHENIUM CATALYSTS FOR NOX REDUCTION. Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1974. 9 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., Feb. 25- March 1, 1974, Paper 740250.)

Some of the problems encountered in the use of ruthenium as a nitrogen oxide reduction catalyst are described. The major problem of volatilization in high temperature oxidizing atmospheres has been overcome by providing a stabilizing matrix for the ruthenium. The stabilized catalyst, however, does not have good carbon monoxide and hydrocarbon oxidizing performance, which is required when the NOx catalyst is used for oxidation under cold start conditions. Coimpregnation of Ru and platinum is ineffective in improving this situation, and it was necessary to develop a novel procedure to improve catalyst oxidation activity. Engine dynamometer tests showed that the final catalyst performs well under all of the conditions to which it is subjected. It removed more than 90% of the NOx, CO, and HC. The durability of this NOx system in actual car operation is still unknown and is being studied. (Author abstract modified)

59387

APTIC NO. 83321

Krygowski, Richard P.

EXHAUST GAS HEATED ENGINE INTAKE MANIFOLDING AND FUEL VAPORIZER. (Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,841,284. 6p., Oct. 15, 1974. 8 refs. (Appl. March 22, 1973, 6 claims).

An engine intake manifold construction is described that quickly vaporizes liquid fuel in the carbureted fuel/air mixture. The manifold has an exhaust gas crossover passage that passes between the manifold carburetor riser bores and the manifold outlets to the engine cylinders. The riser bores are connected by thin sheet metal high heat transfer tubes that pass through the crossover passage so that the exhaust gases flow around the walls of the connecting portions of the tubes and vaporize any raw fuel running down the tube walls. The tubes have liquid fuel dams at their lower closed ends to trap liquid fuel and minimize passage of it to the engine cylinders, and conical deflectors to move liquid fuel from the walls into the air stream. Conventional engines operate under rich mixture choking conditions for a longer period than is desirable for both engine operating efficiency and good emission control. (Author abstract modified)

59388

APTIC NO. 70656

Kuipers, H.

LARGE DUST COLLECTION SYSTEMS IN METALLURGICAL PLANTS. (*Grossstaubungsanlagen in Huettenerwerken*). Text in German. Tech. Mitt., 67(7/8):295-297, July/Aug. 1974. 3 refs.

A brief review is given of the operating principle of wet (venturi scrubbers) and dry (cyclones, cloth filters) mechanical dust collectors and wet and dry electrostatic precipitators. Wet dust collectors are increasingly being used, primarily because of the low investment costs and the low space requirement. All dry mechanical dust collectors can be put together from small units to any desirable size. Pursuing the material flow in metallurgical plants, the first dust collector, a cyclone for collection of the coarse dust, is installed at the ore crushing and grinding station. At the sintering station, electrostatic precipitators are installed. The blast furnace is preceded by a cloth filter and succeeded by a wet electrostatic precipitator.

For avoidance of brown smoke, electrostatic precipitators or venturi scrubbers succeed the converters. Cloth filters have been used increasingly for electric furnaces. Behind reverberatory kilns, wet electrostatic precipitators are used.

59389

APTIC NO. 79901

Kumar, Ashok

APPLICATION OF MOLECULAR SIEVES FOR DRYING, DESULPHURIZATION, REMOVAL OF CARBON-DIOXIDE AND OTHER UNDESIRABLE GASEOUS CONTAMINANTS. *Chem. Age India*, 25(6):387-391, June 1974.

The significance of molecular sieves as commercial adsorbents depends on the fact that the crystals contain interconnecting cavities of uniform size, separated by narrower uniform openings. The tremendous combined surface area and pore volume are available for adsorption of water or other materials. Molecular sieves desorb with equal efficiency. They exhibit a particularly strong affinity for molecules which are unsaturated, polar, or polarizable. Adsorption techniques are compared with conventional sulfur removal processes for light olefin treatment. Conventional processes include caustic wash, the merox process, and amine scrubbing. The Molecular Sieve adsorption techniques are easy to handle, equipment maintenance problems are almost eliminated; complete automation makes this process feasible for continuous operation. Drying and purification of paraffinic liquid hydrocarbons of gases is typically carried out in a dual bed system. One bed is under adsorption while the other bed is being thermally regenerated. Operating costs for a Molecular Sieve process compares favorably with the alternative purification processes.

59390

APTIC NO. 83352

Kutryk, Edward Adam

POLLUTION CONTROL APPARATUS. (Assignee not given.) U. S. Pat. 3,844,746. 14p., Oct. 29, 1974. 12 refs. (Appl. March 22, 1973, 8 claims).

A mobile apparatus is described for use in the on site cleaning of effluent gases contaminated with solids such as at asphalt batching plants used in the preparation of paving materials for roads. The apparatus includes a horizontally extending tank, having towing capabilities. A gas scrubbing unit is mounted on the tank for vertical movement between an upper operating position, and a transit position in which the unit is at least partly accommodated within the tank. The tank has an inside bottom, leading in a continuous manner to a sloping end surface of the tank, and dredging means inside the tank are arranged, when driven, to collect a sediment deposited on the inside bottom, and move it up the sloping end surface of the tank for discharge from the tank. The scrubbing unit uses water or other liquids from the tank in the form of sprays to clean gas flowing in a helical manner from an inlet near one end of the scrubbing unit towards an outlet near the other hand of the unit.

59391

APTIC NO. 80150

La Haye, Paul G., Glenn D. Craig, and Joseph L. Turecek

REDUCTION OF NITROGEN OXIDES FROM PRODUCTS OF HYDROCARBON COMBUSTION WITH AIR. (Aqua-Chem., Inc., Milwaukee, Wis.) U. S. Pat. 3,832,122. 7p., Aug. 27, 1974. 7 refs. (Appl. Jan. 6, 1972, 20 claims).

A combustion device adapted for reducing the nitrogen oxides in its exhaust gas was invented. Fuel is burned in a primary combustion zone so that a substantial quantity of unburned hydrocarbon, such as carbon monoxide, is produced along with some nitrogen oxides. Essentially no oxygen remains at the completion of the combustion process. The gaseous combustion products are conducted through a gas dispersion matrix or bed in which the unburned hydrocarbons and NOx react to produce carbon dioxide and nitrogen. Air is then injected into the gases in a secondary combustion zone to ox-

idize the residual unburned hydrocarbons to CO₂. The exhaust gases are substantially free of air polluting CO and NOx. (Author abstract modified)

59392

APTIC NO. 76350

Lauren, Oscar Bud

ODORS AND MALODORS: REMOVAL, DESTRUCTION AND MODIFICATION. *Purdue Univ., Lafayette, Ind., Ind. Waste Conf. Proc.*, 29th, Lafayette, Ind., 1974, p. 60-66. (May 7-9.)

Odor modification is discussed, including the application of modifying agents for contained and uncontained sources of malodor pollutants. They include: direct addition, spraying, metered feeding, and dispensers. Where the malodor is due to gaseous discharge from an exhaust chimney, the odor modification material must be atomized as finely as possible and injected into the base of the stack. Animal by-product factories, storage warehouses, and the petroleum industry are examples where good results can be obtained with stack spraying. No attempt should be ever made to modify or otherwise disguise any gas or vapor that may be toxic or harmful. Where it is feasible and economical, odor should be eliminated at the source. (Author summary modified)

59393

APTIC NO. 84332

Lawson, A.

UREA AS A CATALYST FOR LOW TEMPERATURE NOx CONTROL. *AIChE Symp. Ser.*, 70(137):77-82, 1974. 3 refs.

Experiments investigating the use of urea as a catalyst for low temperature nitrogen oxide control are reported, with particular emphasis on the removal of NOx under moist oxidative conditions such as those occurring in diesel engine exhaust. Supported urea catalysts at 60 C are particularly effective for NOx removal, with charcoal being an efficient surface for oxidizing nitric oxide to nitrogen dioxide. Urea/charcoal catalysts are rapidly poisoned at high oxygen concentrations, however. Urea/alumina catalysts are effective in removing NO₂ but are very ineffective in removing NO even in the presence of oxygen. Application of the process to vehicular exhaust control suffers from a number of problems. The fastest reaction rate observed with urea catalysts is 0.0000056 moles/g/min which is at least two or three times too slow for achieving the desired control with a reasonable size of catalyst bed. A more serious restriction is the temperature limitation arising from the thermal instability of urea above 100 C. Proposed reaction mechanisms are given for urea catalysis of NOx.

59394

APTIC NO. 84325

Lemmon, Alexis W., Jr.

ENVIRONMENTAL IMPACTS OF COAL GASIFICATION AND LIQUEFACTION FACILITIES. *American Inst. of Chemical Engineers, New York, Dayton and Ohio Valley Sections and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Committee on Energy-Environmental Interactions, Energy Environ. Natl. Conf.*, 2nd, Oxford, Ohio, 1974, p. 115-120. 5 refs. (Nov. 13-15.)

A review of the environmental impact of coal gasification and liquefaction facilities is presented. Air pollutants generated during the production of high or low Btu gas include sulfur dioxide from Claus plant tail gases and carbon dioxide. Emissions associated with coal liquefaction processes include nitrogen oxides, carbon monoxide, and some sulfur dioxide released during the gas purification and sulfur removal step. Reduced sulfur compounds like hydrogen sulfide, carbonyl sulfide, and carbon disulfide occur in the initial product streams of virtually all coal conversion processes, and the escape of these compounds to the air is possible as a result of incomplete removal or leakage. Hydrocarbon emissions from coal conversion processes can occur as a result of leakage in liquid product storage areas. Other gaseous emissions such as hydrogen chloride, hydrogen cyanide, and ammonia may also be associated with coal conversion plants.

59395

APTIC NO. 79243

Lindsay, R., A. Thomas, and J. L. Wilson

MIXTURE QUALITY, GASOLINE VAPORISATION AND THE VAPIPE. Preprint, National Engineering Lab., East Kilbride, Glasgow (Scotland), 14p., 1974. 3 refs.

The use of gasoline vaporization to improve fuel economy and reduce automobile exhaust emissions is described along with a device designed to achieve gasoline vaporization at the engine inlet. The fuel vaporization device is known as the Vapipe and is designed to utilize exhaust heat to vaporize the gasoline, thus resulting in improved mixture quality. The improved mixture quality obtained with the Vapipe enables a considerable extension of the weak mixture limit which favors nitrogen oxide and carbon monoxide reduction. Emissions tests on an otherwise uncontrolled automobile outfitted with the Vapipe and adjusted to operate at an air-fuel ratio of between 18.5 and 20.5:1 revealed NO_x, CO, and hydrocarbon levels ranging from 1.0-1.8 g/mi, 6.2-7.4 g/mi, and 4.3-7.2 g/mi, respectively. Improved fuel economy was also obtained.

59396

APTIC NO. 79289

Lovett, W. D. and R. L. Poltorak

ACTIVATED CARBON AND THE CONTROL OF ODOROUS AIR POLLUTANTS. In: *Industrial Odor Technology Assessment*. Paul N. Chermisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 19, p. 313-336. 21 refs.

The use of activated carbon to control odorous air pollutants is reviewed, with particular emphasis on low-concentration/large-volume emissions and small-volume sources such as storage tanks and reactor vessels. Activated carbon is capable of adsorbing and/or catalyzing the destruction of such compounds as toluene, styrene, hydrogen sulfide, aldehydes, mercaptans, alcohols, ketones, acids, nitriles, sulfides, diphenyls, and other organic vapors. Typical applications include: sewage treatment, rendering, food processing, textile manufacturing, foundry, and chemical processing operations.

59397

APTIC NO. 82710

Marchenko, G. S. and A. S. Kushch

USE OF BOILER ASSEMBLIES OF HEAT AND ELECTRIC POWER PLANTS FOR RENDERING HARMLESS VENTILATION EMISSIONS FROM SYNTHETIC FIBER PRODUCTION PLANTS. (*Ispol zovanie kotel nykh agregatov teplovykh elektrostansiy dlya obvrezhivaniya ventilatsionnykh vybrosov predpriyatiy khimicheskikh volokon*). Text in Russian. *Energ. Elektrif.*, vol. 4:8-11, 1974.

The method of cleaning industrial air containing sulfur by feeding it into the furnaces of boilers of heat and electric power plants was tested at a Kiev synthetic fiber plant. The burning of fuel in the stoker of a boiler using ventilation waste of viscose products led to a small increase in sulfur dioxide formation in flue gases. When waste air was cleaned by the thermal method, the total emission of polluting industrial gases into the atmosphere decreased twofold, and toxicity was reduced 2.5 times. This means of decontaminating industrial waste air effectively solves the problem of cleaning large volumes of polluted air and rationally utilizes operative thermal power equipment. It also significantly improves the hygienic state of the air basin of cities. Nevertheless, measures aimed at protecting the equipment and low-temperature heating surfaces from corrosion and at protecting areas where boiler assemblies are in use against contamination from polluted air must be taken.

59398

APTIC NO. 72662

Matsushita, Masao

AIR FILTER APPARATUS. (*Kuki roka sochi*). Text in Japanese. (Matsushita Electric Power Tool Co., Ltd., Osaka (Japan)) Japan. Model Util. Sho 49-45024. 3p., Dec. 9, 1974. (Appl. May 24, 1971, 1 claim).

AIR POLLUTION ABSTRACTS, JUNE 1976

An air filter system with high filtration efficiency and equipped with a shaking device for dust removal from the filter bags is described. Multiple numbers of filter bags with lower openings are attached to the frame at equal intervals. The frame is fastened to the air filter cabinet just above the air inlet located on the lower side wall. The upper ends of the filter bags are suspended by a yoke ultimately connected to the crank shaft of the dust shaking device, which is suspended from the cabinet ceiling by springs right below the air outlet leading to the air blower. Several layers of racks attached to chains at equal intervals are suspended from the yoke for the purpose of preventing the bulging of filter bags which would block air passage. The air is filtered at the position where the filter bag is stretched out. By turning the crank shaft, the filter bag can be stretched and contracted to shake the dust off.

59399

APTIC NO. 84331

Mayland, B. J. and R. C. Heinze

CONTINUOUS CATALYTIC ABSORPTION FOR NITROGEN OXIDES EMISSION CONTROL. *AIChE Symp. Ser.*, 70(137):83-87, 1974. 11 refs.

The use of continuous catalytic absorption for nitrogen oxides emission control is reviewed, with particular emphasis on the control of emissions from nitric acid plants. The main elements of the process are an absorber using catalyst packing, a stripper, and nitric acid as the absorption medium. The process removes and recovers NO_x as nitric acid via an oxidation reaction. Continuous catalytic absorption appears to be feasible for any stream containing dilute NO_x in air. Pressure operation is helpful, but the process can be applied to any pressure level, with the optimum pressure level being determined by economics.

59400

APTIC NO. 76467

McAlevy, R. F., III, R. B. Cole, J. W. Hollenberg, L.

Kurylko, R. S. Magee, and K. H. Weil
HYDROGEN AS A FUEL. *Stevens Inst. of Tech., Hoboken, N. J., Office of Naval Research Contract N00014-67-A-202-0046, Rept. ME-RT-74011, 236p., Aug. 31, 1974. 173 refs.*

NTIS, DDC: AD-787 484

Hydrogen production by electrolysis, coal gasification, and thermochemical decomposition of water was investigated. Much of the current effort in electrolyzer design is directed toward developing the high efficiency potential of electrolysis. The Koppers Totzek process is currently the preferred coal gasification process in applications where only hydrogen is required. New processes of coal gasification are not expected to make substantial changes in the presently used coal gasification techniques within the next 5 yr. Hydrogen production by thermochemical processes employing nuclear heat sources has excellent potential to meet future hydrogen demands. However, extensive research and development will be required to advance currently proposed processes to commercial practice. Compressor stations along hydrogen pipelines will be required to periodically boost the pressure, as is now the practice in the natural gas industry. Existing compressor station designs can be adapted for hydrogen service. Operating experience with hydrogen fueled reciprocating engines is reviewed with emphasis on thermodynamic performance and pollutant emissions. Hydrogen operation allows high efficiency and low pollutant emissions. To gain these advantages of using H₂, engines must be operated at lean fuel mixtures. The chemical energy content of the lean mixture is reduced under such conditions. Conventional supercharging or cylinder fuel injection can compensate for such a power penalty while maintaining the advantages of H₂ use. Hydrogen is an attractive alternative to gasoline and other hydrocarbons as engine fuels, from many viewpoints. (Author abstract modified)

59401

APTIC NO. 82285

McLlwee, Roy J.

CATALYTIC VS THERMAL OXIDATION: AN OPERATING COST COMPARISON. *Factory*, 7(9):45-47, Sept. 1974.

Operating costs can be cut in half when combustible pollutants are removed from gas streams by incinerators using catalytic oxidation instead of thermal oxidation. Incineration employs the same oxidation reaction, chemically and thermodynamically, whether it is thermal or catalytic. The difference is that the catalyst causes the required degree of oxidation in less time than would otherwise be required, and at lower temperature. Many existing thermal incinerators can be converted to catalytic incineration. The few limitations on the application of catalytic oxidation are mostly associated with the fact that the catalysis is a surface phenomenon. Intricate manufacturing techniques have been developed to provide maximum catalyst surface/unit volume. Catalytic oxidation is not recommended for gas streams that contain highly abrasive particles, or substances that are not destroyed by oxidation and might coat the catalyst. A pilot incinerator, through which a portion of the gas stream in question can be diverted, will provide complete data, including fuel consumption. While tests need only determine if the catalyst will be effective in oxidizing the pollutant and not be adversely affected by components of the gas stream, a catalyst test cell can be loaned for insertion in an existing thermal incinerator. Such catalyst tests are constantly being made, and are steadily adding to the list of gases, fumes, and odors that can be removed from gas streams with substantially reduced fuel consumption, all by catalytic oxidation.

59402

APTIC NO. 73561

Mestre, Andre

EFFICIENCY AND POLLUTANT FORMATION STUDIES IN A SWIRLING FLOW COMBUSTOR. *Preprint, American Society of Mechanical Engineers*, New York, 7p., 1974. 5 refs. (Presented at the American Society of Mechanical Engineers, Symposium on Fluid Mechanics in Combustion, Montreal, Quebec, May 13-16, 1974.)

The effect of swirl on combustion efficiency and carbon monoxide and nitrogen oxide production from a swirling flow combustor was studied by comparing results obtained for zero swirl angle against those for a 57 deg angle. The swirling inlet flow was injected through variable direction kerosene injection nozzles into the combustor which measured 170 mm in length and 200 mm in diameter. A swirl angle of 57 deg, using a high quality air-kerosene mixture, resulted in a 19% increase in combustion efficiency and decreases in carbon monoxide and nitrogen oxide production of 65 and 55%, respectively. Nitric oxide was decreased by 67%.

59403

APTIC NO. 81813

Minet, Ronald G.

SYNTHETIC FUEL - A TECHNOLOGICAL SOLUTION TO AIR POLLUTION PROBLEMS. *Chem. Eng. World*, 9(4):63-68, April 1974. 15 refs. (Presented at the Joint Meeting of the American Institute of Chemical Engineers - Institute Mexicano de Ingenieros Quimicos, 3rd, Denver, Colo., Aug. 21-Sept. 1970.)

The technical and economic feasibility of substituting methanol for other fuels is discussed. Methanol can be easily produced from coal, heavy oil, and other fossil fuels as well as from future atomic power sources and can be used in internal combustion engines and fuel cells. The use of methanol as automobile fuel is expected to significantly reduce hydrocarbon, carbon monoxide, and nitrogen oxide emissions, although catalytic emission control devices will probably still be required to meet future standards. Methanol is also capable of substituting for gasoline without serious disruption of present distribution systems or the petroleum industry. The complete substitution of methanol for gasoline is estimated to require the production of 1.3 million tons/day at a cost of \$13 billion for the necessary new plants.

59404

APTIC NO. 80299

Modersitzki, W. and H. J. Wiemann

TECHNOLOGICAL INVESTIGATIONS OF A NEW INDUSTRIAL DUST SEPARATOR. (*Verfahrenstechnische Untersuchungen an einem neuen Apparat zur industriellen Entstaubung*). Text in German. *Luft Kaeltech.*, 40(3):154-156, 1974. 1 ref.

Laboratory experiments with a new combined tissue filter and electrostatic precipitator are described. Talc dust was used for the experiments. The dust filter is designed as a vertical bag filter with discharge electrodes placed within and between the filter bags. The dust is separated by filtration and electrostatic precipitation on electrodes which are in the form of wire nettings. Wire nettings with mesh over 0.25 mm prevented filter cake formation, and consequently an increase in the pressure loss. The energy consumption was higher than for an electrostatic precipitator but lower than for a tissue filter, while the operating costs were lowest in the case of the combined tissue filter-electrostatic precipitator.

59405

APTIC NO. 76182

Murthy, Keshava S.

CHARACTERIZATION OF SULFUR RECOVERY IN OIL AND NATURAL GAS PRODUCTION (FINAL REPORT). *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Office of Air and Waste Management Contract 68-02-0611, Task 6, Rept. EPA-450/3-75-081, 125p., Aug. 1974. 30 refs.*

NTIS: PB 248602/AS

Sulfur removal and recovery processes at oil and natural gas processing plants in the United States are reviewed. Detailed descriptions of 14 major and four minor processes for sweetening (removing hydrogen sulfide) sour gas, two processes for the recovery of sulfur, and six processes for tail gas cleanup are provided. The Claus process is the most widely used process for the production of sulfur from acid gases, and efficiencies range from 90-97%. Tail gas cleaning systems are available for increasing sulfur recovery of Claus plants to 99.7% or higher. The most widely used processes for the removal of H₂S and other sulfur compounds from sour natural gas are the Sulfinol, Selexol, Benfield, monoethanolamine, and diglycolamine processes. (Author conclusions modified)

59406

APTIC NO. 83309

Nakajima, Yasho, Shin-Itchi Nagumo, Toru Yoshimura, and Saburo Usui

EXHAUST CLEANING APPARATUS FOR INTERNAL COMBUSTION ENGINES. (*Nissan Motor Co., Ltd., Yokohama City (Japan)*) U. S. Pat. 3,842,600. 14p., Oct. 22, 1974. 8 refs. (Appl. March 21, 1973, 9 claims).

An exhaust cleaning apparatus for a motor vehicle internal combustion engine is described. The apparatus uses a converter unit consisting of a reducing catalyst to reduce the nitrogen oxides in the exhaust gases and an oxidizing catalyst to oxidize the carbon monoxide and unburned hydrocarbons in the exhaust gases passed from the reducing catalyst. Additional hydrocarbons are injected into the exhaust gases entering the reducing catalyst when the engine is operating on an air fuel mixture having a relatively large air to fuel ratio and/or when the exhaust gases contain a practically negligible amount of nitrogen oxide. Unlike other devices, this device is adapted to provide economy in fuel consumption. (Author abstract modified)

59407

APTIC NO. 83600

Nakamura, Kazumasa

HYBRID ELECTRIC CAR. (*Toyota Jidosha Kogyo Kabushiki Kaisha, Toyota-shi (Japan)*) U. S. Pat. 3,842,287. 8p., Oct. 15, 1974. 7 refs. (Appl. June 11, 1973, 12 claims).

An electric car powered by both battery and heat engine driven generators is described. Unlike in other electric cars, the battery and generator connection is controlled on the basis of the input by the operator and optimum speed control is obtained. The connections of the battery and generator are changed so that they energize the motor, either in parallel or in series with each other, on the basis not only of the motor speed, but the extent to which an operator depresses the accelerator pedal. These features improve the driving performance of the vehicle and allow it to operate at high efficiency with minimum battery discharge.

59408

APTIC NO. 83294

Nakamura, Takezo and Yukio Iwasaki

METHOD AND APPARATUS FOR THERMALLY DECOMPOSING REFUSE. (*Shinmeiwa Kogyo Kabushiki Kaisha, Tokyo (Japan)*) U. S. Pat. 3,841,239. 10p., Oct. 15, 1974. 3 refs. (Appl. June 15, 1973, 9 claims).

A method and apparatus for the pyrolysis of refuse containing a random mixture of organic and inorganic materials is described. The apparatus includes an upright cylindrical furnace, a refuse chute having at the uppermost part of the furnace doors which are always able to shut off the outside atmosphere, a combustible gas outlet located in the middle of the furnace, a heat molten material bath located at the lowermost part of the furnace, a mean for directly heating the heat molten material in the tank, and exhaust openings formed respectively in the middle and lower parts of the tank. Materials chiefly composed of metallic oxides are kept molten in the molten material bath shut off from the outside atmosphere. The combustible gas by-product of the pyrolyzed organic materials in the refuse dropped into the bath is taken outside the bath and the silicious by-product and metallic by-product are taken outside the bath respectively from above and below the molten material. This system overcomes the problems in other system, in which immense labor in maintenance and repair of the grates as well as extended periods of downtime during the repair and maintenance is required. (Author abstract modified)

59409

APTIC NO. 83293

Niebyski, Leonard M. and Peter A. Immethun

METAL CATALYSTS AND METHOD. (*Ethyl Corp., Richmond, Va.*) U. S. Pat. 3,842,159. 5p., Oct. 15, 1974. 6 refs. (Appl. June 21, 1972, 7 claims).

An exhaust gas catalyst is described which contains nickel with a surface deposit of a noble metal. The noble metal and alkali metal compound are deposited by contacting Ni with solutions of the noble metal and alkali metal compounds. More than one deposition can be used. If a first deposition of palladium is followed by contacting the Ni with strong nitric acid, a second Pd deposition results in an increased amount of Pd on the Ni surface. The Ni can optionally be heated after deposition of the noble metal to improve catalytic activity. This heating is accomplished by exposing the Ni having a noble metal deposit to hot engine exhaust gas and then applying the alkali metal compound. Unlike other catalysts, this catalyst is effective in reducing nitrogen oxides in engine exhaust. (Author abstract modified)

59410

APTIC NO. 78262

Nishiyama, Osamu, Yoshiaki Toyoda, and Wataru Karasawa

EXPERIMENTAL INVESTIGATION OF EXHAUST DUCTS FOR LARGE GAS TURBINE SYSTEM. (*Ogata gasu tabin haiki dakuto no jikken*). Text in Japanese. *Kawasaki Giho (Kawasaki Tech. Rev.)*, no. 54:31-38, July 1974.

The packaged-type emergency gas turbine generating set using the aero-derived Olympus SKID-20 gas turbine is being developed at KHI. The exhaust system, composed of exhaust volute, steeply spreaded diffuser and silencer, has to be compact and light in weight, which is encountered by the fluid-

AIR POLLUTION ABSTRACTS, JUNE 1976

dynamic problems of uneven velocity causing extraordinary vibration and noise and occasionally silencer damage. Using a 1/10 scale model, the velocity distribution at the exhaust volute outlet, silencer inlet (with and without deflectors), and silencer outlet (with and without deflectors), flow angles at the silencer outlet, static pressure fluctuation at exhaust volute outlet, duct wall vibration, total pressure loss and noise level at the silencer were measured. The use of deflectors in a diffuser-type duct was found to be most effective. At the silencer inlet, maximum local velocity ratio was reduced from 5.0 to 3.5 times the mean velocity as the result of the increase in effective flow area ratio from 67% to 90%. The duct-wall vibration and duct wall static pressure-fluctuation were reduced to 60% as the result of improvement in velocity distribution.

59411

APTIC NO. 73322

Noki, S. K. Kotera, and T. Mizoguchi

A CONTROL METHOD FOR NOX EMISSION FROM SMALL SCALE BOILERS. (*Kotei hasseigen kara hassei suru chisso sankabutsu ni tsuite. (II)-Kogata boira no chisso sankabutsu no ro no kaizo ni yoru teigen taisaku ni tsuite-*). Text in Japanese. *Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution)*, 9(2):412, Nov. 1974. (Presented at the National Air Pollution Research Conference, Nov. 6-8, 1974, 15th, Chiba Japan, Paper 263.)

The reduction in nitrogen oxides emissions from small scale boilers by two-stage combustion and exhaust gas recirculation was experimentally explored. The water-pipe type boiler and cylindrical furnace type boiler were tested using three types of heavy oil and kerosene as fuels. In the water-pipe type, the exhaust gas inlet was placed in the air duct so that it would be mixed into the air supply, and the secondary air injection ports for two-stage combustion were placed at the front, back, and side of furnace. In the cylindrical furnace, the secondary air inlets were placed in a circular position at the front of the burner, through which the exhaust gas was also injected. In the case of the cylindrical furnace, the reduction rates in NOx by exhaust gas recirculation and two-stage combustion were 19-23% and 28-30% for heavy oil A, and 15-21% and 11-16% for heavy oil B, respectively. In the case of the water-pipe type, the reduction rates by exhaust gas recirculation was 53% for kerosene, 40% for heavy oil A, and 8-8.5% for heavy oil C. The difference in reduction rate by the two methods is slight. A certain degree of reduction can be realized by these methods, however, the reduction rate varied considerably with the type of fuel.

59412

APTIC NO. 83272

Novakovich, Milan

HIGH EFFICIENCY POLLUTANT-FREE COMBUSTION GAS GENERATOR. (*Assignee not given.*) U. S. Pat. 3,841,098. 7p., Oct. 15, 1974. 5 refs. (Appl. Jan. 19, 1973, 28 claims).

A high efficiency pollutant-free gas generator for generating high pressure gases for driving turbines and other motors is described. The overall efficiency of this motor is far superior even to the most efficient stationary, constant revolution/min diesel engines due to the reduced requirement of fuel/horse power/hr, and especially due to the novel mode of pollutant-free combustion. The new motor is a Rankine cycle heat motor consisting of a gas generator or boiler. High pressure gas is generated by the application of heat to a working liquid. The high pressure gas is ducted to a turbine or a piston engine, where its kinetic energy is converted to mechanical work.

59413

APTIC NO. 83520

Obrzut, John J.

HIGH SOLIDS GIVE FINISHES NEW OPTION. *Iron Age*, 214(21):45-48, Nov. 18, 1974.

The use of high solids coatings in metal finishing is discussed. High solids coatings are organic coatings with at least 80% solids by volume and containing no more than 20% solvent by

CONTROL METHODS

59419

volume. In terms of pollution control, the emissions from powder coating are negligible. The high solids coatings compare very favorably with industrial water based enamels and with electrodeposition if the effluents from the ultrafiltration units are taken into account. High solids allows for much reduced solvent effluent and at an attractive cost.

59414

APTIC NO. 83472

Oglesby, Sabert, Jr. and Grady B. Nichols

ELECTROSTATIC PRECIPITATOR TECHNOLOGY FOR SOURCE EMISSION CONTROL. *AIChE Symp. Ser.*, 70(137):351-356, 1974.

Factors affecting the operation and particle collection efficiency of electrostatic precipitators are reviewed. Topics covered include: the relationship of precipitator efficiency to gas volume and plate area as expressed by the Deutsch-Anderson equation, the effect of particle size on particle charge and precipitator performance, the effect of particle size on migration velocity, the effect of electric field on the saturation charge on particles, the effect of space charge and power supply parameters on the electric field of the precipitator, changes in specific collecting surface required for increased efficiency, the effect of high particle resistivity on precipitator performance, factors affecting the reentrainment of collected dust, and techniques used for designing precipitators for a given application.

59415

APTIC NO. 79281

Olenik, Thomas J.

DOMESTIC SEWAGE AND REFUSE ODOR CONTROL. In: *Industrial Odor Technology Assessment*. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 9, p. 117-146. 49 refs.

The control of odors from sewage treatment plants and refuse landfills is discussed. Odorous emissions from these sources generally contain mercaptans, ammonia, sulfides, phenols, sulfur dioxide, and various organic nitrogen compounds such as pyridine. The prevention of odors from sewage treatment plants is often most effectively and economically accomplished by proper plant operation. Chemical treatment provides a convenient method of control when the odors originate from organic sources. Chlorination is the most popular chemical odor treatment method. Odor counteractants can be added to sewage flow and can be effectively sprayed on other odor-causing sources. Combustion is one of the more desirable odor control techniques. Chemical oxidation with ozone can be applied to grit and screening chambers, aeration tanks, vacuum filters, and sludge tanks. Absorption of odorous gases can be applied to various covered unit processes. Sanitary landfill odor control can be achieved by the proper application of deodorizing chemicals such as Ozene.

59416

APTIC NO. 73177

Oshiba, Takashi

CONTINUOUS DESULFURIZATION METHOD AND DEVICE BY ACTIVATED CARBON. (*Kasseitan no renzoku datsuryuho oyobi sono sochi*). Text in Japanese. (Showa Denko Co., Ltd., Tokyo (Japan)) *Japan. Pat. Sho.* 49-43469. 3p., Nov. 21, 1974. (Appl. Dec. 28, 1970. 2 claims).

The continuous desulfurization method and device for cleaning exhaust gas containing sulfur dioxide and sulfur trioxide by means of adsorption on activated carbon or metal oxide or metal salt carried on activated carbon and subsequent desorption with water are described. A vertical or horizontal adsorption tower packed with adsorbent is equipped with several water sprayers, which are turned on successively. While one sprayer is on for the desorption as sulfuric acid, the adsorption continues in the other parts of adsorption tower, allowing the continuous and simultaneous operation of adsorption and desorption. The increase in flow resistance of gas is slight,

since the water is sprayed at a small portion of adsorbent at one time.

59417

APTIC NO. 81960

Paulson, C. A. J., E. C. Potter, and R. Kahane

NEW IDEAS ON PRECIPITATOR TECHNOLOGY FROM THE CSIRO COMBUSTION RIG. *Preprint, Inst. of Fuel, Adelaide (Australia)*, 26p., 1974. 11 refs. (Presented at the Changing Technology of Electrostatic Precipitation Symp., 1974.)

A pilot scale coal burning electrostatic precipitation rig is described and its use for assessing the precipitation behavior of fly ash is explained. A method of plotting dust collection efficiencies against a combined function of specific collection area and applied voltage has been developed, which yields a performance line for the precipitator handling a given dust under stated conditions of temperature and carrier gas composition. The performance lines permit the comparison of the precipitation behavior of fly ashes from different coals, and are useful in assessing flue gas additives and in estimating the design size of full scale precipitators from pilot plant observations. The additives investigated include ammonia, sulfur trioxide, trimethylamine, triethylamine, and cyclohexylamine. The performance lines show that triethylamine at trace levels improves precipitator performance dramatically with difficult fly ashes, the improvement being due to agglomeration of suspended dust and raising of breakdown voltage. Some other additives, particularly cyclohexylamine, worsen precipitator performance by lowering breakdown voltage and dispersive natural dust agglomerates. (Author abstract modified)

59418

APTIC NO. 76218

Pazin, L. M. and L. M. Meitin

USE OF GAS SCRUBBERS AFTER ROASTING MACHINES. (*Ekspluatatsia gazoochistnikh ustanovok za objigovimi maschinami*). Text in Russian. *Metallurg.*, no. 8:38-39, 1974.

Gas at two different velocities in the active zones of an electrostatic precipitator was tested to determine the optimal regime of discharging of the settling electrodes, voltampere characteristics, chemical composition of gas and dust, and ohmic resistance. The efficiency of electrostatic precipitators with a belt-needle corona type and C-shaped settling electrodes is 96% at the mean velocity 1.86 m/s and 98.7% at 1.48 m/s. The dust percentage according to fraction size was: for less than 44 millimicron, 75.45%; for 44-58 millimicron, 8.65%; for 58-74 millimicron, 7.2%; for 74-100 millimicron, 6.5%; for more than 100 millimicron, 2.2% (before electrostatic precipitation); for 2 millimicron, 10%; for 2-5 millimicron, 16%; for 5-10 millimicron, 16%; for 10-20 millimicron, 18%; for 20-40 millimicron, 16.7%; for 40-70 millimicron, 18.7%; for 70-80 millimicron, 1.9%; for 80-150 millimicron, 2.7%; and for 150 millimicron, 0% (after electrostatic precipitation). The design of the gas scrubbing unit is given.

59419

APTIC NO. 67092

Pentecost, J. L. and J. K. Cochran

LOW EXPANSION CERAMIC MATERIAL FOR CATALYSIS SUPPORTS. *Preprint, Society of Automotive Engineers, Inc., New York*, 6p., 1974. 11 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., Feb. 25-March 1, 1974. Paper 740198.)

The characteristics of cordierite-type compositions and the relationship between thermal expansion and raw materials, processing, and gross composition are examined with respect to their use in catalytic devices for reduction of automobile exhaust emissions. Other possible support materials are reviewed briefly, including mullite, zircon, beryl, spodumene, aluminum titanate, silicon nitride, and other low expansion compositions. Raw material cost, processing, and reactivity with the catalysis are discussed for these materials. (Author abstract modified)

59420

APTIC NO. 84314

Peters, Werner

POSSIBILITY AND LIMITS OF A NEW GASIFICATION TECHNOLOGY. (Möglichkeiten und Grenzen einer neuen Vergasungstechnologie). Text in German. *Erdoel Kohle - Erdgas - Petrochem.*, 27(9):507-508, 1974.

Gas from coal gasification is free of sulfur and dust. Gasification with nuclear reactor heat would also reduce the carbon dioxide emission considerably (to 63%) compared to conventional gasification processes. The limits of the new technology are imposed by the reaction kinetics of the conversion of coal with water vapor. Considerable amounts of soft coal can be converted only above 650 C, of hard coal, above 760 C. Prerequisite for the use of gas-cooled high-temperature reactors is a temperature of the helium-operated cooling circuit at the outlet of the reactor which is considerably higher than the temperature of the gas generator. Studies have shown that for the heat transfer on the gasification reactor a heat exchanger similar to an immersion heater can be used. It seems feasible to find a material suitable for the high temperatures which is sufficiently corrosion resistant. Calculations of the heat balance of a total plant have shown that the heat supply of the reactor for gasification increases greatly with rising exit temperature of the helium from the nuclear reactor. The feasibility of coal gasification with nuclear reactor heat will be demonstrated by a pilot plant to be ready by 1982.

59421

APTIC NO. 83588

Petersen, Helge Høgh

ELECTRODE CLEANING MECHANISM FOR ELECTROSTATIC DUST PRECIPITATOR. (F. L. Smidth and Co., Cresskill, N. J.) U. S. Pat. 3,844,742, 7p., Oct. 29, 1974. 16 refs. (Appl. Feb. 16, 1973, 17 claims).

An electrode cleaning mechanism for electrostatic dust precipitators is described. It has at least one eccentrically mounted electrode vibrated by a rapping mechanism. It includes a tumbling hammer that is rotated about a horizontal shaft so that it continually swings down in a pivotal pendular movement until the impact surface of the hammer strikes against the end of a rapping bar. It is sharply moved axially out of a rest position to jar the electrode. The rapping bar is urged back to its rest position after jarring the electrode by the weight of the eccentrically mounted electrode, which is connected to the rapping bar during this return movement. Usually, the collecting electrodes are cleaned by shaking or vibration created by rapping or striking the collecting electrodes or their attachment irons. This procedure a very high mechanical stress, particularly in the tumbling hammers and the rapping bars, producing heavy wear and a decrease in the life of the mechanism. This problem is eliminated in this apparatus because the distance between the point of impact with the rapping bar and the pivot axis of the hammer is substantially equal to the radius of gyration of the hammer. (Author abstract modified)

59422

APTIC NO. 67089

Pfoutz, B. D. and L. L. Stewart

MATERIALS OF CONSTRUCTION FOR ELECTROSTATIC PRECIPITATORS. Preprint, American Inst. of Chemical Engineers, New York, 14p., 1974. (Presented at the American Institute of Chemical Engineers, Annual National Meeting, 76th, Tulsa, Okla., March 10-13, 1974.)

Materials of construction for electrostatic precipitators are discussed in relation to functional precipitator operation, corrosion, strength, life, and economics. Choice of material depends on service requirements for a specific application. Special considerations for design and materials are outlined for precipitators operating continuously at high temperatures. Various precipitator applications are discussed relative to choice of construction materials. Precipitator components discussed include the enveloping structure, discharge electrodes, collecting electrodes, and insulators. (Author abstract modified)

59423

APTIC NO. 81956

Pugh, J. L. and L. N. Fletcher

EXPERIENCE IN HANDLING AND CONSUMING BASIC OXYGEN FLUE DUST IN A SINTER PLANT. Armco Steel Corp., Ashland, Ky., Ashland Works, Waste Oxide Recycling Steel Plants Proc., 1974, p. 4-1-4-5.

Since basic oxygen flue dust contains approximately 50% iron, reclamation becomes the most desirable method of disposal. An attempt was first made to feed the dust into the sinter mix through the existing miscellaneous material system. Putting dust through this system failed because much of the dust was lost due to the numerous transfer points and uncovered conveyors. Mixing the dust with available thickener sludge seemed to work very well when sufficient mixing was obtained. The degree of mixing was not consistent, however, due to the size of the area available for mixing and the difficulty of mixing the two materials. A system designed specifically to handle the flue dust was installed. The system and the problems encountered with it are described. The system was redesigned and proved successful. The changes made are described. The dust zinc content was controlled at a level which would not adversely affect the blast furnace. This was accomplished through elimination of zinc contaminated scrap. (Author abstract modified)

59424

APTIC NO. 82291

Puri, Rajaish

SYSTEM DESIGN FOR PARTICULATE CONTROL IN WOODWORKING PLANTS. *Heating, Piping, Air Conditioning*, 46(9):54-58, Aug. 1974.

The design of systems for controlling woodworking plant emissions is discussed. Disposal of collected material and recirculation of exhaust air are discussed. Hood and duct design call for maximum efficiency at minimum air volume. The capture velocity depends on the opposing air currents involved and the size and quantity of generated dust particles. A capture velocity greater than actually required will result in an increased volume of air handled, unnecessarily increasing the size of a dust collection system. Duct design is discussed. Baghouses have proved to be the most efficient type of equipment for controlling dust emission at low overall cost. The exhaust fan system should be designed to take care of inlet and outlet duct resistances and the resistance of the baghouse itself. A positive pressure system is suitable for picking up dust from one area and delivering it to many points. A vacuum or negative pressure system is especially effective in picking up dust from many points and delivering it to one area. A combination pressure-vacuum system is typically used in remodeling an existing system and is simply a method of accommodating the increased pressure drop. If hoods are properly designed and situated, exhaust air can be recirculated to a plant after filtration. A hood opening close to the source may be necessary to obtain proper capture velocity. There are several markets for wood dust and chips that make recovery potentially profitable.

59425

APTIC NO. 79291

Raleigh, Charles W.

ODOR CONTROL WITH HYDROGEN PEROXIDE. In: *Industrial Odor Technology Assessment*. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 24, p. 369-391. 37 refs.

The usefulness of hydrogen peroxide in odor control is reviewed. Hydrogen sulfide in combination scrubbing and other control processes can be used to oxidize or decompose odorous compounds such as sulfides, mercaptans, sulfur dioxide, aldehydes, amines, phenols, and nitrogen oxides. Typical applications include: pulp and paper manufacturing, sewage treatment, food processing, textile manufacturing, chemical processing, metal finishing, and animal manure treatment facilities. Hydrogen peroxide is also effective in inhibiting bacterial growth.

59426

APTIC NO. 83890

Rao, P. Haragopala and Arun Jyoti Roy

AUTOMOTIVE EXHAUST EMISSIONS CAUSING AIR POLLUTION. *Indian Eastern Eng. (Bombay)*, no. 116:91-94, 1974. 6 refs.

Methods of reducing automotive exhaust emissions are described. In one method, carbon monoxide and hydrocarbons are reduced by special carburetion or fuel injection with a suitably retarded ignition and a turbulent chamber. Recirculation of the exhaust gases or injection of water is used to reduce nitrogen oxides emissions. In another method, the amount of nitric oxide is maintained at a low level by the use of a rich mixture and retarded ignition timing. Air injection exhaust gas reactors or catalytic converters are used to reduce hydrocarbons and carbon monoxide emissions. The most efficient reduction of pollutants occurs from the use of low air-fuel ratios, timed air injection into an exhaust reactor, and recirculation of exhaust gases. (Author conclusions modified)

59427

APTIC NO. 83325

Ray, Frank M.

DUST COLLECTOR BAG MOUNTING ARRANGEMENT. (Flex-Kleen Corp., Chicago, Ill.) U. S. Pat. 3,844,750. 8p., Oct. 29, 1974. 6 refs. (Appl. March 28, 1973, 20 claims).

A dust collector bag cup mounting arrangement is described which uses a helical coil externally secured upon the bag cage for threaded cooperation with an internal thread surface on a collar carried by the tube sheet. The sleeve-shaped open-end portion of a filter bag extends in air-tight relation between the helical coil and the internal thread surface to provide an arrangement which achieves, in comparison to other devices, a more effective seal in that it is compatible with the operating environment and resistant to vibration while accommodating greater manufacturing tolerances and reducing manufacturing costs. (Author abstract modified)

59428

APTIC NO. 73761

Regehr, U.

REMOVING MISTS BY GAS STREAM DEFLECTION. *Design Eng. (Canada)*, 20(8):28-29, Aug. 1974. Translated from German by Freeman Newton, Grandview Industries, Ltd., Mississauga, Ontario.

An inertial mist eliminator for removing liquid droplets ranging from 1-2000 micron in size from gas streams is described. The eliminator consists of a series of deflector blades arranged in parallel such that the gas stream is deflected from its original path, giving rise to a relative movement between the droplets and gas which causes the droplets or a liquid film to form on the sides of the blades. The liquid is then forced toward phase separators by the pressure of the air stream. The force of the gas stream becomes ineffective in the immediate vicinity of the phase separators, and the liquid runs off due to gravity. The phase separators also reduce the turbulence of the gas stream (and thus pressure loss) and prevent droplets from being dragged out of the eliminator and into the clean air stream. The eliminator efficiency rises exponentially with gas stream velocity.

59429

APTIC NO. 83215

Reiquam, H. E.

CONTROL OF AIR POLLUTANT EMISSIONS. (Kontrola izvora oneiscenja zraka). Text in Serbo-Croatian. *Arhiv Hig. Rada. Toksikol. (Yugoslavia)*, 25(4):493-497, 1974.

Different sources of air pollution in various parts of the U. S. are discussed. Four basic approaches to emission control as they apply to oil, natural gas, and coal are described. The approaches are: fuel substitution, improved fuel quality, technological changes (e.g., catalytic converters), and administrative measures, such as passing strict emission control laws.

59430

APTIC NO. 83753

Renault, Philippe, Andre Deschamps, and Claude Dezael

PROCESS FOR PURIFYING GASES CONTAINING SULPHUR COMPOUNDS AND RECOVERING ELEMENTAL SULPHUR. (Institut Francais du Petrole, des Carburants et Lubrifiants (France)) U. S. Pat. 3,845,197. 4p., Oct. 29, 1974. 13 refs. (Appl. Jan. 24, 1972, 20 claims).

A process for purifying a gas stream containing sulfur compounds such as carbonyl sulfide (COS) and carbon disulfide is described. The stream is passed, together with steam, at 250-400 C, over an alumina containing catalyst to produce hydrogen sulfide. A portion of the H₂S is oxidized to sulfur dioxide at 300-500 C to obtain a ratio H₂S/SO₂ from 1.6 to 3. The SO₂ is reacted with the remaining portion of H₂S at 20-160 C to produce elemental sulfur. This process produces an effluent with a lower S content than other processes. (Author abstract modified)

59431

APTIC NO. 84299

Renault, Philippe, Andre Deschamps, and Claude Dezael

PROCESS FOR MANUFACTURING SULFUR FROM A GAS CONTAINING HYDROGEN SULFIDE AND SULFUR DIOXIDE. (Inst. Francais du Petrole, des Carburants et Lubrifiants, Rueil-Malmaison, France) U. S. Pat. 3,832,454. 6p., Aug. 27, 1974. 3 refs. (Appl. Jan. 11, 1972, 24 claims).

A process for manufacturing sulfur from a gas containing hydrogen sulfide and sulfur dioxide is described. Sulfur is manufactured from hydrogen sulfide and sulfur dioxide at a temperature from 100-180 C in a reaction medium containing ammonia and an organic solvent containing an alkali metal salt of a weak acid. The outflow from the reaction zone is cooled down and washed in two steps and the condensates are recycled to the reaction zone. The addition of ammonia is an improvement over other processes. Ammonia, even in amounts lower than 0.2% by volume in the gaseous phase, improves the catalytic stability of the alkali metal salts. The process is particularly useful for controlling atmospheric pollution. (Author abstract modified)

59432

APTIC NO. 83754

Rhoades, Vaughan W.

FIREFLOOD POLLUTION PREVENTION. (Cities Service Oil Co., Tulsa, Okla.) U. S. Pat. 3,845,196. 3p., Oct. 29, 1974. 2 refs. (Appl. Sept. 28, 1973, 10 claims).

A process for the removal of hydrogen sulfide from gases formed by subterranean combustion of hydrocarbons is described. An oxygen-containing gas is heated by a combustion engine employed to drive a compressor which injects air into a fireflood operation. The heated oxygen-containing gas is contacted with H₂S containing combustion product gas from the underground combustion of the fireflood operation. The O₂ and H₂S react to form elemental sulfur, which can be recovered. Pollution of the atmosphere with H₂S is mitigated. No other process can reduce environmental pollution when fireflood operations are used to recover hydrocarbons from subsurface formations which contain hydrocarbons and S compounds. (Author abstract modified)

59433

APTIC NO. 83581

Roe, Edward H. and James D. Patton

COKE OVEN EMISSION CONTROL SYSTEM. (Great Lakes Carbon Corp., New York) U. S. Pat. 3,844,901. 9p., Oct. 29, 1974. 3 refs. (Appl. March 19, 1973, 5 claims).

A device for reducing gaseous and particulate emissions from the discharge of coke from the coke side of a coke oven battery is described. It includes an entrapment structure attached to and extending the length of the top of the coke side battery. The structure has an enlarged top section which serves as an expansion zone for the gases. The roof of the structure is

formed by less than horizontal panels, and wall members depend from the roof panels to the coke quench car or below, but do not touch the ground. A tapered duct extends the entire length of the structure with air scoops suitably positioned to remove the finer fractions of particulates and thermal gases when the duct is placed under partial vacuum. Unlike other devices, this device is of a permanent or stationary nature and is not a part of the coke guide or coke quench car. (Author abstract modified)

59434

APTIC NO. 81782

Roll, J. L., D. L. Day, and B. A. Jones, Jr.

MUNICIPAL SLUDGE IN SWINE MANURE HELPS CONTROL ODOR. *Ill. Res.*, 16(2):14, Spring 1974.

The use of municipal digester sludge for initiating anaerobic activity and controlling odors from liquid swine manure was investigated. Sniff panel tests indicated that a 1:5 manure to sludge ratio resulted in the least offensive odor, while a digester with a 2:1 manure to sludge odor proved to be the most offensive. However, the best degradation was observed in a digester with the most odor, indicating that a tradeoff may be required to achieve adequate solids reduction. Digesters with 2:1, 1:1, 1:2, 1:5, and 1:10 manure to sludge ratios yielded methane compositions of 71.1, 68.6, 67.8, 67.9, and 67.0%, respectively. Yields of carbon dioxide were: 27.1, 29.0, 29.6, 30.2, and 30.7%, respectively.

59435

APTIC NO. 79107

Rounds, Gerald L. and George Geminder

PROBLEMS OF RECYCLING WASTE OXIDES THROUGH THE SINTER STRAND. (BAGHOUSE EXPERIENCE). *Preprint, Kaiser Steel Corp., Fontana, Calif.*, 11p., 1974.

Steel sintering equipment is described. Cyclones and fans are used for particulate control. The percent feed and the chemical and physical characteristics of the materials sintered are listed. The materials include iron ore fines, limestone, scrap, coke breeze, blast furnace dust, roll scale, and oxygen shop dust. The problems encountered with each are described. Open hearth dust and blast furnace gas washer sludge are not sintered because of their high zinc and water contents, respectively. Fine mill scale sludge is not fed to the sinter plant because of the undesirable stack plume it produces. The iron content and heat value of this material are presently being lost. The baghouse control on the exhaust gases is discussed. Approximately 12 bags are replaced per month. Mechanical maintenance of the baghouse is described. All of the collected dust from the baghouse is recycled through a closed screw system to the feed belt to the sinter plant pug mill. The addition of water to the sinter has the desirable effect of reducing the ambient dust loading of calcined lime in the work area. The fugitive dust at the sintering strand discharge is also discussed. (Author abstract modified)

59436

APTIC NO. 83755

Sakai, Toshiyuki and Yutaka Ushimaru

CATALYST FOR USE IN PURIFICATION OF EXHAUST GASES. (Mitsui Mining and Smelting Co., Ltd., Tokyo (Japan)) *U. S. Pat.* 3,844,980. *Sp.*, Oct. 29, 1974. 8 refs. (Appl. Dec. 29, 1972, 2 claims).

A catalyst for converting carbon monoxide and hydrocarbons contained in exhaust gases into harmless components was developed. It is prepared by applying to at least one oxide of transition metals in the 4th Period of the Periodic Table, a small amount of at least one metal belonging to Group 8 or Group 1B, and to the 5th or 6th Period. Other catalysts are made from noble metals and are sensitive to catalytic poisons and lose their activity easily due to the effect of lead, halogens, and carbon derived from gasoline. (Author abstract)

59437

APTIC NO. 83560

Sanders, J. W. and D. J. Vaughan

NEW FINISH FOR HIGH TEMPERATURE GLASS FABRIC FILTERS. *Filtration Separation (Purley)*, 11(4):362-363, July/Aug. 1974.

The need for the development of a new finish for high temperature glass fabric filters is discussed. The baghouse with its multiple bags is the most effective and economical device for fine dust and fume collection. The bag filter is limited to relatively low temperature applications for lack of a suitable temperature resistant material. Glass fabric is the only economical material that is commercially available for general use in high temperature gas filtration. Many finishes used in conjunction with glass fabric are limited in temperature stability to temperatures under 500 F. A new finish, CS-315 was developed which is capable of use at temperatures up to 750 F, and, for short periods, 800 F. It is economical.

59438

APTIC NO. 74199

Sano, Hiroshi

REMOVAL OF SULFUR OXIDES BY NEUTRALIZER PREMIXING INTO FUEL. (II) REMOVAL OF SULFUR OXIDES FROM FLUE GAS BY THE EMULSION INJECTION OF CALCIUM SALTS OF VARIOUS FATTY ACIDS. (Nenryo yokongo-shiki haen datsuryu-ho, dai 2-ho, shibosan karushiumu o shiyo suru nyuka sekkai fukikomishiki haen datsuryu). *Text in Japanese. Osaka Kogyo Gijutsu Shikensho Kiho (Bull. Gov. Ind. Res. Inst., Osaka)*, 25(3):174-178, Sept. 1974. 2 refs.

A lime emulsion injection process for the removal of sulfur oxides from flue gas is described that utilizes an aqueous solution of the calcium salts of various fatty acids. Fuel oil is emulsified with the aqueous fatty acid-calcium salt solution and is then burned. The calcium oxide formed by the thermal decomposition of the fatty acid salt absorbs the SO_x, thus reducing the concentration of SO_x in the flue gas. The method can be used for flue gas SO₂ concentrations as low as 25-100 ppm for a calcium/sulfur ratio of 1. Between 80 and 95% of the SO_x can be removed for fuel oils containing 1-3% sulfur. Tests with different fatty acids revealed no difference in their SO_x removal effect, though the solubilities of the resulting calcium salts differ significantly. The most soluble salt, calcium acetate, can be applied to oil containing from 3-4% sulfur, while calcium butylate, which is less soluble, can only be applied to fuel oils containing about 1% sulfur. Other fatty acids tested can only be used with very low sulfur-containing fuel oils.

59439

APTIC NO. 83146

Sato, Kazuo and Masamitsu Nakano

SMALL TYPE 2-CYCLE ENGINE EFFICIENCY, CONSIDERING PREFIRING AND NITROGEN OXIDES, NO. 1. (Kogata 2 saikuru kikan ni okeru fukikaeshi o koryoshita seino to chisso sankabutsu, 1). *Text in Japanese. Shibaura Kogyo Daigaku Kenkui Hokoku (Res. Rep. Shibaura Inst. Tech.)*, no. 8:195-203, 1974. 2 refs.

The relation between nitrogen oxide emission and the performance of a small two-cycle engine built with blow-back preventive measures was studied. Three different types of engine cylinders with frequent, moderate, and minor blowback allowances were tested at various rotational speeds and air/fuel ratios. The theoretical portion of the investigation is reported in this article (part 1), which mainly concerns the scavenging theory related to blowbacks. The composition of the combustion gas is explained theoretically in terms of a scavenging model, a combustion equation, an equation for gas composition before scavenging, the volume of wet and dry cylinder gas, an equation for composition of exhaust gas and total volume of dry exhaust, an equation for combustion temperature, an equation for air inlet efficiency, and an equation for scavenging efficiency and air supply ration. The report concludes that the effect of the blowback process can be

ignored in calculating the air supply ratio and the scavenging efficiency, and that from the analysis of gas composition and combustion temperature, air inlet efficiency and scavenging efficiency can be determined.

59440 APTIC NO. 79910

Schmidt, Peter and Osvaldo Bejerman

METHOD TO REDUCE NOXIOUS COMPONENTS IN INTERNAL COMBUSTION ENGINE EXHAUST GASES, AND APPARATUS THEREFOR. (Robert Bosch GmbH, Gerlingen-Schillerhohe, West Germany) U. S. Pat. 3,831,564. 7p., Aug. 27, 1974. 4 refs. (Appl. Dec. 14, 1972, 12 claims).

A method and apparatus were invented to reduce the noxious components in the exhaust systems of internal combustion engines by controlling the mass ratio of air to fuel. The composition of exhaust gases is sensed and an electrical signal is derived representative of the composition, which has at least two discrete values. A control signal is generated which continuously increases or decreases and is applied to control the mass ratio of air and fuel supplied to the engine. The direction of variation is controlled in dependence on the discrete value of the control signal. An operating parameter signal of the engine is also generated, and the rate of variation of the control signal is changed as a function of the operating parameter signal; the controller typically is an integrating type controller, in which the integrating rate is changed as commanded by an engine operating parameter. (Author abstract modified)

59441 APTIC NO. 76287

Scholl, Friedrich

METHOD TO REDUCE NOXIOUS COMPONENTS IN THE EXHAUST OF INTERNAL COMBUSTION ENGINES. (Robert Bosch GmbH, Schillerhohe (W. Germany)) U. S. Pat. 3,832,848. 5p., Sept. 3, 1974. 12 refs. (Appl. July 12, 1972, 12 claims).

A method for reducing the noxious components in the exhaust of internal combustion engines is described. The ratio of fuel to air of the air-fuel mixture being applied to internal combustion engines is adjusted so that it is below the stoichiometric value. The composition of the exhaust gases from the internal combustion engine is then sensed before they are discharged in the atmosphere. Additional air is introduced to the exhaust gases before their liberation so that a predetermined optimal relationship with respect to the stoichiometric value is obtained. In other systems accurate control of the air number (a measure of the composition of the air fuel mixture) requires a comparatively complex apparatus so that control of this air number is so set that the exhaust emission becomes a minimum. (Author abstract modified)

59442 APTIC NO. 83605

Scott, Milford M., Jr. and Floyd J. Wheeler, Jr.

EXHAUST GAS RECIRCULATING VALVE. (STP Corp., Ft. Lauderdale, Fla.) U. S. Pat. 3,844,260. 12p., Oct. 29, 1974. 2 refs. (Appl. Nov. 1, 1972, 26 claims).

An improved pollution control device designed to utilize exhaust gas recirculation in an internal combustion engine as the means for reducing oxides of nitrogen, carbon monoxide, and hydrocarbons is described. Unlike other devices, this device is relatively inexpensive to make and can be installed on used automobiles or on new automobiles. It provides for fresh air intake during engine operation through a plate valve automatically self-responsive to the differential pressure of the atmosphere, the intake manifold, and the exhaust manifold for reducing NOx and other pollutants.

59443 APTIC NO. 83574

Sebastian, Frank P., Terry D. Allen, and William C. Laughlin, Jr.

WHEN DISPOSING OF SLUDGE YOU MAY WANT TO THINK THERMAL. *Water Wastes Eng.*, 11(9):47-50, Sept. 1974.

The environmental advantages of sewage sludge incineration are discussed. Sludge incineration systems meet existing air quality standards to produce acceptable stack emissions of nitrogen oxides, sulfur oxides, odors, and particulate matter. Polychlorinated biphenyls (PCBs) are completely destroyed in the sludge furnaces. Destruction of 94 to 96% is observed in the normal exhaust temperatures of 650 and 800 to 900 F. By using the much lower exhaust temperature, a fuel savings of up to 60-80% is realized over norms of other methods along with low emission levels of pollutants. Hydrocarbon, carbonyl, and carbon monoxide emissions can be regulated to meet the standards imposed on the BAAPCD regulations and the Environmental Protection Agency stationary Source Regulations. Nitrogen oxides emissions are dependent on the particular sludge being processed.

59444 APTIC NO. 79532

Seckar, Jiri

DESULFURIZATION OF FLUE GASES. (Odsirovani kourovych plynu). Text in Czech. *Stavivo*, 52(8):241-244, Aug. 1974. 7 refs.

Equipment and processes used for desulfurization of flue gases by European, American, and Japanese industries are reviewed, with a special emphasis on economic effectiveness. Cement and lime manufacturing processes are discussed. A desulfurization process in a cement producing system, consisting of a rotary oven, a heat exchanger, and a mill, is outlined. The efficiency of absorption of sulfur compounds in the heat exchanger is 98%. Desulfurization can be improved by using flue gas as a drying agent in the mill at 300 C. The allowable amounts of sulfur dioxide, ash, and other pollutants are specified by the CSSR Law 35/1967. At the present time the flue gases emitted by Czechoslovak cement and lime factories have a lower content of sulfur dioxide than that specified by the law. It is expected, however, that more stringent air pollution laws will be passed in the near future, compelling the industry to seek new solutions to the problem of desulfurization.

59445 APTIC NO. 72857

Seidlitz, Steve

CONVERTING A GASOLINE AIR-COOLED ENGINE TO PROPANE. Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 8p., 1974. 3 refs. (Presented at the Society of Automotive Engineers National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., Sept. 9-12, 1974, Paper 740746.)

The conversion of a 60 cu in. L-head, air-cooled, 2-cylinder, aluminum industrial engine from gasoline to propane is described, with particular emphasis on carbon monoxide exhaust levels measured. An air valve piston-type carburetor and an exhaust-heated stainless steel coil vaporizer appear to offer the best overall performance. Carbon monoxide levels do not reach 0.1% until 50% load, though at idle CO levels below 0.2% are achieved only at an air/fuel ratio of 20:1 resulting from the high residual exhaust in the cylinder. The lean operation presents no problems in transient operation or starting.

59446 APTIC NO. 83459

Shanklin, Richard V., III

COMMERCIAL MHD POWER GENERATION DEVELOPMENT. *American Inst. of Chemical Engineers, New York, Dayton and Ohio Valley Sections and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Committee on Energy-Environmental Interactions, Energy Environ. Natl. Conf., 2nd, Oxford, Ohio, 1974, p. 29-34. 16 refs. (Nov. 13-15.)*

The use of magnetohydrodynamics for the generation of electrical power is reviewed in relation to its use in advanced power cycles and its inherent pollution control advantages. About 99.8% of the sulfur in coal used for the process is removed by the potassium recovery stage of the process, thus

eliminating problems of sulfur oxide emissions. Nitrogen oxide emissions can be kept to within 135-328 ppm in the effluent gas if the fuel is either burned in two combustion stages or the combustion gas is cooled sufficiently slowly so that the decomposition of nitric oxide is allowed to approach its equilibrium value. The capital cost of an MHD plant is about the same as that of a conventional coal-fired plant. Exhaust heat from the MHD generator can be used to preheat the combustion air and to provide the heat input to a steam plant.

59447

APTIC NO. 84333

Shelstad, K. A., G. S. P. Castle, and E. B. Kipp

CONTROL OF GASEOUS POLLUTANTS BY MEANS OF ELECTROSTATIC PRECIPITATORS. *AICHE Symp. Ser.*, 70(137):88-95, 1974. 9 refs.

An experimental electrostatic precipitator with corona discharge along the axis and a reactive interface at the wall was used to remove several gaseous air pollutants from mixtures with other gases. The reactive interface was formed by a layer of catalyst in most of the experiments; however, in one series of runs it was formed by a film of liquid absorbent. Toluene, normal-heptane, 1-propanol, and methyl mercaptan were removed from air by oxidation; nitrogen dioxide from nitrogen by decomposition and reduction; and sulfur dioxide from air by reduction and oxidation. Sulfur dioxide was also removed from air by absorption in six different liquids. The corona resulted in significant increases in the gas removal rate for all of the above reactions, except for the reduction of NO₂ and SO₂ where the rate increase was small. The predominant mechanisms introduced by the corona appeared to be increased mass transfer to the reactor wall due to ionic wind and reactions initiated within the ionized sheath of the discharge. (Author abstract modified)

59448

APTIC NO. 83620

Siegert, L. D.

KILNS REUSE DUST THE INSUFFLATION WAY.

Rock Prod., 77(2):52-54, 81, 84, Feb. 1974.

The use of dust insufflation in the cement kiln is discussed. The amount of dust insufflated depends on the dust produced and that fraction of fine dust that must be discarded for the control of alkalies. The efficiency of the kiln in capturing dust and discharging clinker is the ratio of the total dust produced as clinker to the total dust insufflated. The higher the insufflation ratio, the less efficient the capturing process becomes. The limitation to the amount returned by insufflation is the ability to compensate for the chilling effects on the flame and the capacity of the dust handling system. The coarser the material returned, the less effect the dust has on the flame and the overall burning operation. This is because lighter dust particles are more easily airborne and carried out of the kiln, increasing the recirculation of dust.

59449

APTIC NO. 84319

Smith, M. A. and R. R. Furgason

USE OF OZONE IN THE TREATMENT OF KRAFT PULP MILL LIQUID WASTES. PART II. BIODEGRADATION. *Preprint, Idaho Univ., Moscow, Dept. of Chemical Engineering*, 17p., 1974. 3 refs.

The effect of ozonation on the ability of microorganisms to biodegrade kraft pulp mill liquid wastes was evaluated. Ozonated waste showed a higher substrate removal rate constant than unozonated waste by at least 50% in the majority of cases. The increase in biodegradability appeared to be due to a reduction in the toxicity of the material rather than a significant alteration in the chemical structure as a result of ozone oxidation. The ozonation process did, however, completely eliminate noxious odors from the liquid waste.

59450

APTIC NO. 79282

Snow, Richard H.

INVESTIGATION OF ODOR CONTROL IN THE RENDERING INDUSTRY. In: *Industrial Odor Technology Assessment*. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 10, p. 147-174.

Odors from several rendering plants were chemically characterized, and experiments were performed to assess the relative effectiveness of alternate control techniques. Classes of compounds identified in odorous emissions from rendering operations included: sulfides, amines, aldehydes, ketones, alcohols, mercaptans, and hydrocarbons. Reactive scrubbing appeared to be the most promising control method, although incineration might be more economical for small, highly concentrated process air streams. Sodium hypochlorite was the most effective scrubbing reagent for a broad spectrum of odorants.

59451

APTIC NO. 83202

Soda, N. and T. Takano

ANALYSIS OF ENVIRONMENTAL ATMOSPHERIC VINYL CHLORIDE MONOMER CONCENTRATION. (Kankyo kukichu enka biniru monoma nodo no bunseki). *Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health)*, vol. 1974:54-55, 1974.

Vinyl chloride monomer measurement by gas chromatography and detection tubes is described. The indoor air of working areas of polymer molding factories was sampled by a Teflon bag and analyzed the next day by a GC; a direct determination was also made at the working area using a detection tube. Concentrations of 1 to 2 ppm vinyl chloride monomer were indicated by the color change of the detection tube for air without vinyl chloride. The vinyl chloride monomer level obtained by the GC was 1 to 2 ppm lower than the level determined by the detection tube. Therefore the Teflon bag air sampling method for vinyl chloride monomer is suitable. The detection limit for vinyl chloride monomer by GC was 0.1 ppm.

59452

APTIC NO. 83606

Spector, Marshall L. and P. L. Thibaut Brian

REMOVAL OF SULFUR OXIDES FROM STACK GAS.

(Air Products and Chemicals, Inc., Wayne, Pa.) U. S. Pat. 3,843,789, 10p., Oct. 22, 1974. 4 refs. (Appl. Feb. 26, 1973, 10 claims).

A method of preventing the plume of particulate matter emitted in the vapor effluent from ammoniacal scrubbing of sulfur dioxide from flue gases is described. The plume is controlled by maintaining controlled operating conditions. If the product of the partial pressures of water vapor, SO₂, and ammonia is below a certain critical value expressed as a function of the operating temperature, the plume does not appear. The critical limits, based on plottings of repeated experimental data, are expressed in terms of the logarithm of the product of the partial pressures of water vapor, SO₂, and NH₃ as a function of the absolute temperature. (Author summary modified)

59453

APTIC NO. 75972

Springer, Karl J.

EMISSIONS FROM DIESEL AND STRATIFIED CHARGE POWERED CARS. *Southwest Research Inst., San Antonio, Tex., Environmental Protection Agency Contract PH22-68-23, Rept. EPA 460/3-75-001A*, 323p., Dec. 1974. 30 refs.

NTIS: PB 245030/AS

Ten passenger cars; four diesel, three stratified charge, two conventional gasoline, and one gas turbine powered; were evaluated. Emissions were measured by the 1975 light duty Federal Test Procedure for gaseous emissions, smoke, and fuel economy. Chassis dynamometer versions of the 1974 heavy duty diesel smoke and gaseous emissions tests were also employed. Odor measurements were made under seven

steady state and three acceleration conditions. Noise was also measured. All were within the 1977 Federal nitrogen oxides limit, but above the 1978 level. Hydrocarbons and carbon monoxide were less than Federal 1977-1978 limits for all but one of the diesels. Two of the stratified charge cars were below the 1978 Federal CO limit, but only one met 1978 HC limits. Fuel economy results were between 24.9 and 28.5 mpg for the four diesels. The three gasoline fueled stratified charge cars had 24.2 to 27.5 mpg. Combined hydrocarbons and nitrogen dioxide for the four diesels ranged from 5.3 to 9.4 g per kw hr and for the three stratified charge from 9.5 to 12.4 g per kw hr. Transients, more times than not, produced the highest odor intensities. Gasoline exhaust was difficult to rate. The gas turbine car exhaust odor was slight except during cold start. Smoke from the four diesel cars was well below the 1974 limits for truck and bus engines. Smoke output was grossly variable with engine speed. (Author abstract modified)

59454

APTIC NO. 83132

Sato, Kazuo and Masamitsu Nakano

SMALL TYPE 2-CYCLE ENGINE EFFICIENCY CONSIDERING PREFIRING AND NITROGEN OXIDES NO. 2. (Kogata 2 saikuru kikan ni okeru fukikaeshi o koryoshita seino to chisso sankabutsu 2). Text in Japanese. Shibaura Kogyo Daigaku Kenkyu Hokoku (Res. Ref. Shibaura Inst. Tech.), no. 8:204-214, 1974. 5 refs.

The relation between nitrogen oxide emission and the performance of a small two-cycle engine built with blow-back preventive measures was studied. Air-cooled small two-cycle gasoline engines were equipped with three different types of cylinders: model A designed for frequent blow back, model F designed for moderate blow back and high performance, and model H with no blow-back. The exhaust gas sampling locations were prepared at the end of the exhaust tank. Nitrogen oxides sampled by an electromagnetic valve were measured by the naphthyl ethylene diamine method and photospectrometry. Iso-octane and commercial gasoline were used for fuel and various air-fuel ratios and rotational speeds (2000-4000 rpm) were used to study the composition of the exhaust gas and the performance of the engines. The high rotational speed engine and the engine with blow-back preventive measures released less nitrogen oxides; the influence of blow-back on the performance of the engine was minor.

59455

APTIC NO. 84328

Starkman, E. S.

PROSPECTS FOR ATTAINMENT OF THE 1975-76 VEHICLE EMISSION STANDARDS. AICHE Symp. Ser., 70(137):66-74, 1974.

Automotive emission control systems being developed by General Motors for the purpose of meeting the 1975 and 1976 vehicle emission standards are described. A system being developed for meeting the 1975 requirements consists of one catalytic converter for the oxidation of hydrocarbons and carbon monoxide and exhaust gas recirculation for nitrogen oxide control. Secondary air and a high energy electronic ignition system are also used for more dependable mixture ignition. For 1976, two basic catalytic converter systems are being given prime consideration. Both systems entail the use of two catalytic converters. In one system, the NOx reducing converter is in the exhaust system just after the exhaust manifold, and proportional exhaust gas recirculation is also used for NOx control. The other system includes both catalytic converters in one unit of the exhaust manifold, and the system operates in three different modes achieved by valving to control exhaust gas flow.

59456

APTIC NO. 80208

Stefanko, R. and R. V. Ramani

EFFECT OF DIESEL EQUIPMENT ON MINE VENTILATION SYSTEMS. In: *Proceedings of the Symposium on the Use of Diesel-Powered Equipment in Underground Mining*, Pittsburgh, Pa., Jan. 30-31, 1973. Bureau of Mines, Information Circ., no. 8666:324-341, 1974. 12 refs.

The effect of diesel equipment on mine ventilation systems is discussed and applied to a typical mine design. Contamination of underground air by the exhaust of diesel haulage equipment is related to air velocity, equipment speed, the number of trips during an air change in the haulageways, and engine load and adjustment. Modern scrubbers do an effective job of dissolving aldehydes and reducing exhaust gas temperatures before discharge into the mine atmosphere. Other gases such as carbon dioxide, carbon monoxide, and nitric oxide are virtually unaffected and are discharged from the exhaust at noxious or toxic levels. The mine ventilation system must be capable of immediate dilution of each below certain ceiling levels for the short term and below time weighted threshold limit values for the long term. A ventilation system is evaluated in a typical mine production system. Diesel haulage requirements are determined, contamination per unit is calculated, and the contaminants are accumulated to obtain the most critical condition.

59457

APTIC NO. 84407

Sullivan, T. A. and W. C. McBea

SULFUR UTILIZATION IN POLLUTION ABATEMENT. Bureau of Mines, Washington, D. C. and IIT Research Inst., Chicago, Ill., Mineral Waste Util. Symp. Proc. 4th, Chicago, Ill., 1974, p. 245-254. 3 refs. (May 7-8.)

The utilization of sulfur and chemically modified S in land stabilization was investigated. Low cost, commercially available olefins are used as the modifiers. Through the use of one or a combination of modifiers, the properties of S both in the molten and solid state, are controlled, permitting its use by either direct penetration or in thin crust formation for stabilizations of tailings. The most suitable formulation is S modified with 1% dipentene and 6-7% dichlopentadiene. (Author summary modified)

59458

APTIC NO. 82289

Suydam, Coe

COST, OPERATING, AND EQUIPMENT DESIGN PARAMETERS FOR ODOR CONTROL BY CHEMICAL OXIDATION. Plant Eng., 28(18):81-83, Sept. 5, 1974.

High odorant concentrations favor incineration because the chemical oxidant solution can be costly. Chemical oxidant is generally favored up to a certain percentage of odor reduction; but a costly excess of chemical oxidant is generally required to remove the last trace of odorant. Odorant solubility in the oxidant solution is important. Completeness of oxidation of complicated odorant mixtures is not entirely predictable. Reaction rates of chemical oxidants vary. Safety practices vary with the oxidant's physical form. There are no special storage requirements for stable chemical oxidants. Increasing the chemical oxidant concentration increases the extent of the reaction. There is an optimum pH for each odor control application of chemical oxidation. Important equipment design parameters include gas flow rate liquid flow rate, packing type and size, gas residence time, and temperature. A baffled spray-chamber-type scrubber can treat a large flow with relatively small size, but should be used for only the simplest odor control problems. Packed tower scrubbers are the most popular.

59459

APTIC NO. 73180

Suzuki, Masanao, Yasushi Tomisaka, and Kikuo Yamashita

BEVON-STRETFORD PROCESS. (Bevon - Sutoresofodo purosusu). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(12):1107-1114, Dec. 1974.

The Bevon-Stretford process which treats tail gas from sulfur recovery apparatus is described. Tail gas containing 1-3% sulfur compounds was introduced to a line burner where partial combustion of hydrocarbons was carried out. The resulting gas was led to a hydrogenation reactor where almost all the sulfur compounds were converted to hydrogen disulfide. The gas from the reactor was cooled in a direct-contact cooler where all the water vapors were condensed and removed. The cooled

gas was then led to the bottom of an absorbing tower where the gas was allowed to contact with an alkaline solution and the hydrogen sulfide was recovered as sulfur. The process has many advantages including stable catalyst and reagents at the operating conditions, long catalyst life and possible reduction of the H_2S to below 0.1 ppm. An example showed that H_2S , carbonyl sulfide, sulfur dioxide, and carbon disulfide in tail gas were reduced from 0.6%, 185 ppm, 1473 ppm and 249 ppm to 0%, 12 ppm, 0 ppm and 0 ppm, respectively.

59460

APTIC NO. 84139

Takahashi, Teruo, Toshiro Miyahara, and Toshio Sato

AN OBSERVATION ON A LARGE-SCALE COUNTER-CURRENT CATALYTIC CONTACT SYSTEM. (*Gasu shoriryo no okina koryu sesshoku sochi ni tsuite no ichi kosatsu*). Text in Japanese. Preprint, Japan Society for Chemical Engineering. (Presented at the Japanese Society for Chemical Engineering, Hokuriku Meeting, Toyama, Japan, July 17, 1974.)

For a countercurrent gas-liquid contact apparatus, it is desirable to have a large tower diameter, space ratio, and plate interval to prevent flooding. This results in an over-sized apparatus. As an alternative to reduce the size of apparatus and prevent flooding, a parallel, vertical ascending flow system can be employed for gas-liquid contact. In this system, high-velocity gas changes from wave flow to annular flow and mist flow, and pressure loss shows a minimum in the vicinity of annular flow transformation. Experiments were carried out using a 20 cm by 20 cm by 2 m acrylic resin tower. Results showed that minimum pressure loss appeared near the annular flow and was independent of pipe length and the pipe shape at the gas entrance. The weeping point was also independent of pipe length, but altered with pipe shape at the gas entrance. The pressure loss increased after the minimum point with increasing gas velocity and pipe length.

59461

APTIC NO. 79800

Takashima, Akio, Yoshinobu Hasegawa, and Takeshi Sakano

ON REMOVAL TECHNOLOGY OF NITROGEN OXIDES BY WET METHODS: MON PROCESS AND RELATED MATTERS. (*Shishiki ho ni yoru chisso sanku butsu no jokyō gijutsu ni tsuite: MON puroseshu to sono shuhen*). Text in Japanese. Kogai To Taisaku (J. Pollution Control), 10(1):77-84, 1974. 4 refs.

The general status of nitrogen oxides pollution, toxicity, generation, and removal technology are discussed. The MON (Mitsubishi-Okabe-Nippon Kagaku) process for denitrification of flue gas with K_2MnO_4 (potassium manganate) and $KMnO_4$ (potassium permanganate) is described. Field tests have been conducted for 1 year in an absorption tower (600 N cu m/hr). Sales of small-scale plants have been initiated. In a scrubber (height about 3.8 m), the following results were obtained by the MON process: nitric oxide concentration at inlet, 500 ppm; NO concentration at outlet, 50 ppm; NO_x concentration at inlet, 1200 ppm (including about 20% NO_2 as wash gas); NO concentration at outlet, 40 ppm. As long as the pH of the absorbent liquid is kept above 8 with carbonates or bicarbonates, and $KMnO_4$ concentration is kept above a minimum, there is no change in the effective absorption. Removal rate varies with height of scrubber and contact time. Absorbent liquid remains stable for a long time. Waste liquid from absorption generally has a pH below 9. Its main components are nitrates, sulfates, and manganese dioxide (MnO_2). It is possible to achieve considerable cost reduction by recycling MnO_2 to manufacture K_2MnO_4 and $KMnO_4$.

59462

APTIC NO. 83752

Torosian, Ashod and John B. Giacoletti

CATALYTIC CONVERTER MUFFLER ASSEMBLY. (*General Motors Corp., Detroit, Mich.*) U. S. Pat. 3,841,841. 5p., Oct. 15, 1974. 3 refs. (Appl. Dec. 4, 1972, 4 claims).

A catalytic exhaust muffler is described which is simple and inexpensive in construction. The muffler consists of a plurality of sound attenuating chambers that are adapted to be acoustically coupled to an exhaust pipe and tailpipe. The muffler includes an oxidation catalyst and a bypass valve within the muffler to allow the exhaust gases to be directed to the catalyst but also to be bypassed through the muffler and around the catalyst if the heat of the exhaust gas through the catalyst becomes sufficiently high enough to destroy the catalyst.

59463

APTIC NO. 72599

Tretter, V. J., Jr.

DEVELOPMENT OF A VENEER DRYER EMISSION CONTROL SYSTEM. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1974. 2 refs. (Presented at the Air Pollution Control Association, Pacific Northwest International Section, Annual Meeting, Boise, Idaho, Nov. 19, 1974.)

The design and operation of a veneer dryer emission control system for particulate reduction are described along with results from tests on pilot and full-scale prototype units. The exhaust from the veneer dryers is run through insulated ducting to a central spray section and, after cooling and agglomeration, passes to a high efficiency cyclone section where large agglomerated particles are removed. Water and pitch flow into a separation tank. The cyclone exhaust passes through a packed tower containing a Brink mist eliminator system in its top section. The maximum efficiency expected with the system is 95% when the Brink mist eliminator is used; otherwise the system's efficiency is in the range of 70%. Low temperature drying significantly reduces overall emission loading to the system, although the efficiency of removal for the system is not affected. The system is expected to produce opacity readings of 10% or less.

59464

APTIC NO. 81761

Trimble, L. E.

EFFECT OF SO_2 ON NITRIC OXIDE REDUCTION OVER RU-CONTAINING PEROVSKITE CATALYSTS. *Mater. Res. Bull.*, 9(10):1405-1412, 1974. 10 refs.

The effect of sulfur dioxide on nitric oxide reduction over one ruthenium metal and two perovskite automobile exhaust catalysts was studied. Sulfur dioxide poisoning decreased ammonia formation below 400°C over all three catalysts. Perovskites containing Ru were less susceptible to deactivation from SO_2 poisoning than pure Ru metal. Both perovskite catalysts reached a stable level of catalytic activity under prolonged treatment with 50 ppm of SO_2 , and the activity loss due to SO_2 was not severe for either of the perovskites. Recovery from poisoning increased with decreasing Ru catalyst content.

59465

APTIC NO. 83461

Vatavuk, William M. and Louis Theodore

A COMPREHENSIVE TECHNIQUE FOR CALCULATING PARTICULATE CONTROL DEVICE EFFICIENCIES UTILIZING PARTICLE SIZE DISTRIBUTIONS. *American Inst. of Chemical Engineers, New York, Dayton and Ohio Valley Sections and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Committee on Energy-Environmental Interactions, Energy Environ. Natl. Conf., 2nd Oxford, Ohio, 1974, p. 181-189. 13 refs. (Nov. 13-15.)*

A generalized mathematical technique for calculating the overall collection efficiency of particulate control devices using equipment operating parameters and the size distribution of the particles in the inlet stream is presented. The technique is applied to efficiency calculations for settling chambers, cyclones, venturi scrubbers, and electrostatic precipitators, with each device treating a stream exhibiting an exponential particle size distribution. The method is also extended to cover control devices operated in series. Specific examples illustrating the technique's application to single and multiple control devices are provided. (Author abstract modified)

59466

APTIC NO. 79724

Vejvoda, J. and J. Hrnčíř

DRY AMMONIA TECHNOLOGY FOR FLUE GAS DESULPHURIZATION AND ITS POTENTIAL UTILIZATION IN CZECHOSLOVAKIA-INCLUDING THE COOPERATION WITH POLAND IN FULL-SCALE VERIFICATION AT CZECHOSLOVAK AND POLISH POWER STATION. (Suchá čpavková technologie odsirování spalin a její potenciální možnosti realizace v CSSR, včetně spolupráce s polskou provozní overováním v československých a polských elektrárnách). Text in Czech. *Sborník Prací ÚVÚ, Ústav Vyzkum Využití Paliv (Prague)*, vol. 27:142-190, 1974.

Dry ammonia technology for flue gas desulfurization and its potential utilization in Czechoslovakia is reviewed. Principal findings on the reactions between sulfur dioxide and ammonia in flue gases, the influence of products obtained on the environment, and a potential application in Czechoslovakia in the form of a technical and economic analysis for an 800 MW generating station situated in North Bohemia are summarized. This analysis is compared with other technologies whose application in Czechoslovakia is under consideration.

59467

APTIC NO. 79742

Vejvoda, Josef and Jan Hrnčíř

EVALUATION OF LIMESTONE FOR THE DRY LIMESTONE TECHNOLOGY OF DESULPHURIZATION OF FLUE GASES FROM THERMAL POWER STATIONS. (Hodnocení vapencu pro účely suché vapencové technologie odsirování spalin z tepelných elektráren). Text in Czech. *Sborník Prací ÚVÚ Ústav Vyzkum Využití Paliv (Prague)*, vol. 27:191-278, 1974. 14 refs.

The sulfur dioxide sorption capacity of limestones and dolomites from the most important localities in Czechoslovakia was measured. Reaction kinetic parameters for SO₂ sorption were calculated for these natural limestones. Sorption capacities ascertained are correlated with certain physical and physicochemical properties. Sorption capacities of three Czech and two American limestones of a commercial grain size are measured and their reactivities, before and after the calcination process, are compared.

59468

APTIC NO. 83292

Vogt, Wilhelm, Hermann Glaser, and Helmut Dyrschka

ALUMINATE SUPPORTED CATALYTIC COMPOSITION AS AN EXHAUST GAS CATALYST. (Knapsack Aktiengesellschaft, Knapsack, near Cologne (Federal Republic of Germany)) U. S. Pat. 3,842,015. 7p., Oct. 15, 1974. 5 refs. (Appl. Nov. 17, 1972, 9 claims).

An air pollution control catalyst for internal combustion engines is described which contains an alkaline metal aluminate as the catalyst carrier. The active ingredients are copper, manganese, nickel, and optionally cobalt oxides. The preferred alkaline earth metal aluminates are barium, strontium, and calcium aluminates. Unlike other catalysts, this catalyst is fully active at temperatures up to substantially 1000 C for the combustion of carbon monoxide and hydrocarbons with oxygen containing gases to carbon dioxide and water. (Author abstract modified)

59469

APTIC NO. 76204

Wagener, K. and K. Winter

ADSOX - COMBINATION OF ADSORPTION AND OXIDATION FOR ELIMINATING EMISSION OF ORGANIC FUMES. (ADSOX - Kombination von Adsorbieren und Oxidieren zur Beseitigung von Emissionen organischer Dämpfe). Text in German. *DECHEMA-Monograph*, 75(1452-1485):193-202, 1974.

The ADSOX method for the removal of organic pollutants from air, and its experimental and practical applications are described. According to this discontinuous process, waste

gases with low concentration of organic air pollutants pass through activated carbon for adsorption, after which the adsorbent is regenerated by means of a small volume of hot gas prepared from a mixture of hot inert gas and flue gas. The waste gas thus obtained contains the organic substances in high concentration, and thus they can be incinerated in a compact unit with a small amount of auxiliary fuel. The ADSOX method is especially suitable for the removal of malodorous substances, e.g., in animal carcass processing plants. A 400,000 cu m/hr-capacity ADSOX unit is used for the separation of lubricant vapors in an aluminum cold rolling mill.

59470

APTIC NO. 83475

Waid, D. W.

AFTERBURNERS FOR CONTROL OF GASEOUS HYDROCARBONS AND ODOR. *AICHE Symp. Ser.*, 70(137):420-427, 1974.

The use of afterburners for the control of gaseous hydrocarbons and odors is reviewed. Topics covered include: the definition of thermal incineration, industrial applications for direct gas flame incineration, the present status of thermal incineration, laboratory results from hydrocarbon conversion efficiency tests, and methods of heat recovery. Thermal incineration, which is the process of oxidizing combustible material by raising the temperature of the material above its auto-ignition temperature, is capable of conversion efficiencies greater than 99.9%. Units are simple and relatively economical to install and operate, and direct gas-fired thermal incinerators can readily be worked into an oven or other process heat requirement. When heat is reused in the system or some place else in the plant, very little additional fuel is required for incineration.

59471

APTIC NO. 84312

Walker, W. M.

FLUID BED INCINERATION OF CHLORINATED HYDROCARBONS. *Pace*, 27(8):27-29, Aug. 1974.

The feasibility of fluid bed incineration for disposal of chlorinated hydrocarbons was investigated in a pilot plant study. The off gases from the reactor were passed through a high efficiency cyclone and scrubbed countercurrently with a soda ash solution to remove both hydrogen chloride and chlorine. An incineration temperature of 800 C is insufficient for complete combustion. At 1000 C, autogenous incineration is not quite achieved, a little fuel oil is required to maintain the bed temperature steady. While autogenous combustion depends on such system parameters as heat losses, and is not in itself a measure of the completeness of combustion, the fact that only 85% of the Cl₂ content of the waste liquor reported as chloride or Cl₂ in the scrubber liquors shows that complete combustion is not achieved. When the temperature is increased to 1100 C, the combustion is autogenous and virtually complete recovery of the Cl₂ is achieved. Complete combustion of the chlorinated waste liquor is achieved.

59472

APTIC NO. 80331

Watanabe, T.

NON-DESTRUCTIVE INSPECTION OF WELDED ZONE IN DESULFURIZATION REACTOR VESSEL AND EVALUATION OF THE INSPECTION RESULTS.

(Datsuryo hanno-tou yosetubu no hihakai kensa hoho to sono hyoka). Text in Japanese. *Sekiyu Gakkai shi (J. Japan Petroleum Inst. Tokyo)*, 17(11):932-938, Nov. 1974. 4 refs.

Severe restrictions on the sulfur content in fuel oil create safety problems in oil purification plants, which are becoming larger. Methods of non-destructive inspection of welded zones in desulfurization reactor vessels are reviewed. Presently, the mechanical strength in welded areas of desulfurization reactors can be examined by means of radiation transmission, ultrasonic defect search, and magnetic powder defect search during construction and during the purification operation. The

reliability of each method depends upon the type of defect sought. The radiation transmission method is applicable to most types of defects. Recently an acoustic emission test method was developed for high pressure vessels; Exxon uses this method to test their facilities. This method can detect dynamic defects and will be an important technique in the future.

59473

APTIC NO. 83275

Watanabe, Tamotsu

VENTILATION METHOD AND APPARATUS WITH DUST COLLECTION BY ELECTRIC STATIC PRECIPITATOR. (Nippon Kogei Kogyo Co., Ltd., Tokyo (Japan)) U. S. Pat. 3,844,205. 15p., Oct. 29, 1974. 10 refs. (Appl. Oct. 25, 1972, 13 claims).

A method and apparatus for collecting dust electrostatically is described. A dust particle or mist containing gas formed inside a building is directly introduced into a ventilating chamber provided in the upper portion of the building. The electrostatic dust collection is effected in the ventilating chamber. The dust collection efficiency of this apparatus is greater than other devices, especially in the case of fine particles. Dust particles having a size less than 1 micron can be collected.

59474

APTIC NO. 84298

Wieken, Robert H. and Harland C. Potter

SMOKE ELIMINATOR. (Temperature Control, Inc., St. Paul, Minn.) U. S. Pat. 3,832,144. 5p., Aug. 27, 1974. 6 refs. (Appl. Sept. 21, 1972, 4 claims).

An apparatus for purifying smoke from incinerators is described. The smoke eliminator is connected to the chimney of a building (such as an apartment) and includes a chamber capable of withstanding high temperatures. A power burner is provided to preheat the chamber. The temperature is sufficient to burn out the major portion of the impurities caused by the firing of the incinerator as the gases travel a tortuous path. The smoke is heated to the extent necessary to burn out fly ash and other impurities so that the gases leaving the flue contain particulates well below the minimum standards set by various air pollution bureaus and by the standards set by the Incinerator Institute of America. A novel feature of the eliminator is the provision of a heat sensing device located in the upper of the two chambers near the outlet end. The positioning of the heat sensor ensures that both chambers are thoroughly heated to the necessary temperature. (Author abstract modified)

59475

APTIC NO. 83322

Wiley, Robert F.

CATALYTIC CONVERTER. (Corning Glass Works, Corning, N. Y.) U. S. Pat. 3,841,839. 5p., Oct. 15, 1974. 10 refs. (Appl. Nov. 17, 1972, 4 claims).

A catalytic converter to be used in the exhaust systems of internal combustion engines for emission control purposes is described. The converter consists of an assembly including a pair of general frusto-conical or funnel shaped and concentric metal housings or casings. They form a container surrounding a cylindrical honeycomb core catalytic member of a material having high temperature durability and a low coefficient of thermal expansion, such as a refractory ceramic material. Unlike other containers, this container is designed to compensate for the differences in thermal expansion of the material of the catalytic member and the metal material of the assembly of the housings or casings of the container. (Author abstract modified)

59476

APTIC NO. 83324

Wiley, Robert F.

CATALYTIC CONVERTER. (Corning Glass Works, Corning, N. Y.) U. S. Pat. 3,841,842. 6p., Oct. 15, 1974. 11 refs. (Appl. Dec. 11, 1972, 9 claims).

AIR POLLUTION ABSTRACTS, JUNE 1976

A catalytic converter used in exhaust systems of internal combustion engines for emission control purposes is described. The converter comprises an assembly including a cylindrical metal housing or casing joined to a pair of oppositely disposed generally frusto-conical or funnel shaped metal housings or casings. They form a container surrounding a cylindrical honeycomb core member of material having high temperature durability and a low coefficient of thermal expansion, such as a refractory ceramic material. The container is designed to include mounting means for the core member to compensate for the differences in thermal expansion of the material of the core member and the metal material of the assembly of the housings or casings of the container. Unlike other containers, this design enables the container to be relatively economical and to have satisfactory and relatively durable casings or containers for the core members of the catalytic converters. (Author abstract modified)

59477

APTIC NO. 72656

Wilson, H. H.

A SURVEY OF FLUORINE EMISSION FROM CERAMIC FIRING PROCESSES. *J. Aust. Ceram. Soc.*, 10(3):53-55, Nov. 1974. 28 refs.

The occurrence and control of fluorine emissions during ceramic manufacture are reviewed. Fluorine in exhaust gases is present mainly as gaseous hydrogen fluoride and silicon tetrafluoride and particulate calcium fluoride. Approximately 30-40% of the fluorine is evolved during normal firing, with the amount of emission increasing as the temperature of the process is increased. Fluorine removal efficiencies of over 99% can be achieved with wet scrubbing, though the disposal of the resultant acidic water is a problem. Dry methods of fluorine removal include the use of fluidized-bed reactors, the injection of hydrated lime into the exhaust flue, and adsorption with charcoal. Process modifications involving the removal of fluorides from raw materials or the use of electric heating to reduce the temperature of the glass can also be employed in some sections of the ceramic industry to reduce fluorine emissions.

59478

APTIC NO. 84489

Wise, Henry

THE AMMONIA ROUTE TO NOX CONVERSION IN AUTO-EXHAUST CATALYSIS. *General Motors Corp., Detroit, Mich., Research Labs., Catal. Chem. Nitrogen Oxides Symp., Detroit, Mich., 1974, 16p. 22 refs. (Oct. 7-8.)*

The problem of ammonia formation during the conversion of nitrogen oxides in automobile exhaust by reaction with reducing gases in a dual-bed catalytic converter is discussed in terms of finding a catalyst suitable for the oxidation of NH₃. A number of molybdenum-containing mixed oxide catalysts exhibit high activity and nitrogen specificity for ammonia oxidation; however, these catalysts cause only partial oxidation of hydrocarbons. Thus, utilization of the ammonia route to NO_x reduction in automobile exhaust control may require different catalysts for NH₃ and hydrocarbon/carbon monoxide oxidation.

59479

APTIC NO. 83320

Wood, Henry P.

APPARATUS FOR REDUCING SMOG PRODUCING EMISSION FROM INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,841,283. 5p., Oct. 15, 1974. 4 refs. (Appl. Oct. 12, 1972, 5 claims).

An apparatus for reducing the smog producing exhaust emission of an internal combustion engine is described. Solid state electronics control the fuel-air ratio to the engine in accordance with the thermoconductivity of the engine exhaust gases and/or the catalytic reactions of these gases with appropriate sensors. The apparatus includes a heat sensor resistor subject to the exhaust gases from the engine for produc-

ing signals supplied to an electronic circuit to control the energization of an electric motor that either increases or decreases the fuel-air ratio to the engine depending upon the characteristics of the exhaust gas.

59480

APTIC NO. 79616

Yamada, Tsuneo

CONTROL OF A VAPOR ENGINE. *Mem. Def. Acad. (Japan)*, 14(2):23-39, June 1974. 14 refs.

A new control method for a Rankine cycle power plant, using an expander, is discussed. Pressure-enthalpy diagrams are used to analyze engine operation. The vapor pressure control used by this method at the output from a vapor generator is the same as the drum pressure control at a drum boiler. This power control method using an expansion engine has obvious advantages when applied to the vapor engine cycle for automobiles. The safety of the vapor and fuel economy are improved because vapor temperature at maximum efficiency is about 100 C lower. Vapor pressure control at the vapor generator does not need to directly follow the load fluctuation and is comparatively easy. Load continuance as a cycle will improve. (Author abstract modified)

59481

APTIC NO. 72441

Yamamichi, Yoshikazu and Junichi Nagao

DOWA S BASIC ALUMINUM SULFATE-GYPSUM PROCESS FOR DESULFURIZATION OF WASTE GAS.

(Dowa-shiki enki-sei ryusan arumi sekko-ho no yoru haen datsuryo ni suite). Text in Japanese. *Ryusan to Kogyo (Sulfuric Acid Ind.)*, 27(11):202-207, Nov. 1974.

The Dowa Mining Co. has developed a basic aluminum sulfate-gypsum process to desulfurize waste gas. In this process waste gas is absorbed into a solution of basic aluminum sulfate. The liquor is oxidized by air to sulfuric ion, and then neutralized with powdered limestone, thus precipitating gypsum and also regenerating the basic aluminum solution. The first commercial plant was constructed in October 1972 by the Taenaka Mining Co. to desulfurize waste gas from a molybdenum sulfide roaster containing 7500 ppm of sulfur dioxide. One hundred tons of gypsum is produced monthly and scaling is minimal, even though the plant has been continuously operated since its initiation. Judging from these actual results, it is sufficient to clean the plant once every several months to maintain its condition. In this plant TCA was employed as an absorbing tower obtaining 90% of desulfurization rate with liquid and gas in a ratio of five to one. In June 1974, two large units each treating 150,000 N cu m/hr started operation at the Okayama Works of Dowa. In a medium-scale test using a packed tower, these units showed 98 to 99% absorption rate with minimal scaling.

59482

APTIC NO. 79288

Yang, Michael Y. and Paul N. Cheremisinoff

WET SCRUBBING FOR ODOR CONTROL. In: *Industrial Odor Technology Assessment*. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 18, p. 289-311. 18 refs.

The use of wet scrubbing for controlling odorous air pollutants generated by various industrial processes is reviewed. Wet scrubbing is ideally suited to the treatment of large flows of air contaminated with low odor threshold compounds such as mercaptans or amines. Other odorous compounds which can be effectively controlled by the use of wet scrubbing and an appropriate scrubbing agent include: alcohols, organic acids, ketones, aldehydes, sulfides, and other sulfur compounds. Homogeneous catalysts may be used in chemical wet scrubbing liquids to increase the scrubbing efficiency by increasing the reaction rate and reducing chemical consumption. Corrosion can be a major problem in wet scrubbing systems designed for odor control because of the strong oxidation and chlorination reagents and acidic or caustic neutralization

agents used in such systems. Construction materials for such systems range from mild steel to thermoplastics or fiberglass-reinforced plastics to stainless steel and even special alloys. Usually, thermoplastics and fiber-reinforced thermoplastics deserve first choice for small or medium-size units and for most of the piping and duct systems. Fiberglass-reinforced plastics, stainless steel, or chemical resistant resin-coated mild steel is required for large gas volumes.

59483

APTIC NO. 73175

Yokota, N., N. Suzuki, and T. Mitsui

GAS ABSORPTION APPARATUS. (*Gasu kyushu sochi*). Text in Japanese. (*Showa Denko Co., Ltd., Tokyo (Japan)*) Japan. Pat. Sho 49-43468. 3p., Nov. 21, 1974. 1 ref. (Appl. Dec. 22, 1970, 1 claim).

The absorbent holder device for a gas adsorption tower consists of several sheets of plastic or metal nets with three or more bends at angles of 10-45 deg to the vertical line which are placed vertically at equal intervals. The absorbent is applied to nets by spraying absorbent solution from a spray nozzle located at the top of the tower. For example, 10% sodium carbonate solution is sprayed to nets and used for the absorption of hydrogen fluoride. The absorbed substance is removed by spraying water or Na₂CO₃ solution in the case of HF absorption. Advantages of this device are the simple procedure and efficient absorption, since the pressure loss of gas flow is slight due to its net structure.

59484

APTIC NO. 81801

Young, Larry C. and Bruce A. Finlayson

MATHEMATICAL MODELING OF THE MONOLITH CONVERTER. *Advan. Chem. Ser.*, no. 133:629-643, 1974. 21 refs. (Presented at the American Chemical Society, American Institute of Chemical Engineers, Canadian Society for Chemical Engineering, and European Federation of Chemical Engineering International Symposium on Chemical Reaction Engineering, 3rd, Evanston, Ill., Aug. 27-29, 1974.)

Mathematical models for a monolith converter are developed and applied to the oxidation of carbon monoxide in automobile exhausts. The converter consists of an array of ducts with catalyst coating the walls. The exhaust gas flows axially through the ducts in laminar flow. Alternate models for this type of converter are proposed and solved numerically. A simpler model uses heat and mass transfer coefficients for fully developed flow in ducts to account for the resistance to transfer between the fluid and the catalytic wall. A more complicated model accounts for the distribution of mass and energy in the duct cross section which is assumed to be circular. Both transient and steady-state calculations are performed for conditions which are anticipated during vehicle operation. The mass and energy distributions in the duct cross section are found to be important. Transient calculations predict that the wall temperature can overshoot the steady-state adiabatic temperature and thus contribute to converter failure. (Author abstract modified)

59485

APTIC NO. 76208

Yorovskii, A. Z.

SULFUR IN COALS. (*Sera kamennykh uglei*). *Academy of Sciences of the USSR, Moscow Inst. of Mineral Fuels*, 1960. 289 refs. Translated from Russian. *Indian National Scientific Documentation Centre, New Delhi*, 455p., 1974.

NTIS: TT 70-57216

A brief account is given of the sulfur present in coals of the USSR and a number of countries of Asia, Africa, America, Australia, and Europe. The origin of coal sulfur and the distribution of inorganic sulfur in the coal mass are discussed. A theory is postulated and applied for segregating the coal-pyrite phases. It has made possible computation of all the basic parameters of coal cleaning processes: optimum degree of coal crushing, most favorable density of separation, yield and sul-

fur content of concentrates, middlings, and rejects; and ascertaining the most rational technology of coal cleaning. Special problems encountered in the removal and use of coal sulfur are discussed. Both new dry processes of coal desulfurization and chemisorption and centrifugal wet processes of desulfurization and demineralization of coals are described.

59486

APTIC NO. 70578

DESULFURIZATION PROCESS 5: LIME GYPSUM METHOD OF NKK (NIHON KOKAN CO., LTD).
(*Datsuryu puresesu sono 5, NKK shiki sekkai sekko ho*).
Text in Japanese. Kagaku Kojo (Chem. Factory), 18(11):62-63, Nov. 1974. 2 refs.

The desulfurization apparatus installed at the Nihon Kokan Koyasu Plant is discussed. The process utilizes sulfur dioxide gas absorption by calcium salt. The desulfurization efficiency by calcium hydroxide was better than that achieved by calcium carbonate. The process consists of the following units: limestone mixing both where a pH 12 of 7% calcium hydroxide slurry is prepared; an absorption tower where the SO₂ gas and the slurry are contacted to produce calcium sulfite; a pH tower where the pH of the calcium sulfite solution is adjusted for effective oxidation; an oxidation tower where calcium sulfite is oxidized to calcium sulfate; and a thickener and a centrifugal separator where the final gypsum is obtained. The process can treat 62,500 normal cu m/hr of gases. The desulfurization efficiency of the process is 90%, and the final gypsum contained 7-8% water.

59487

APTIC NO. 72806

Federal Energy Administration, Washington, D. C.,
Interagency Task Force on Solar Energy

PROJECT INDEPENDENCE BLUEPRINT: SOLAR ENERGY (FINAL REPORT). 560p., Nov. 1974. 54 refs.
GPO

The potential production capabilities of the solar industry and the resources necessary to achieve these levels of products were estimated. Economically viable solar energy conversion systems can be developed and installed in substantial numbers well before the year 2000 to provide significant quantities of energy and power for the United States. Research and development programs and implementation scenarios are described for six technically feasible solar energy technologies for heating and cooling buildings, providing high temperature heat, and producing electric power or clean fuels. Projections of potential upper-bound annual energy contributions of each of these six solar energy technologies are presented at 5-year intervals up to the year 2000. The widespread, domestic, long-term, reliable availability of solar energy resources and the general environmental acceptability of solar energy power systems are emphasized. (Author abstract modified)

59488

APTIC NO. 72811

Federal Energy Administration, Washington, D. C.,
Interagency Task Force on Natural Gas

PROJECT INDEPENDENCE BLUEPRINT: NATURAL GAS (FINAL REPORT). 222p., Nov. 1974. 6 refs.
GPO

The potential production capabilities of the natural gas industry and the resources necessary to achieve these levels of production were estimated. Two alternative strategies were evaluated: business as usual, which assumed the continuation of all current policies that could affect levels of natural gas production, and accelerated demand which assumed selected changes in policies or practices that would permit a greater expansion of potential production. The price-supply-resource relationships that might or could exist under these alternative scenarios were approximated. Data in three general categories were generated: production data, price and cost data, and resource input data. The development of conventional natural gas resources does not have significant long-term environmen-

AIR POLLUTION ABSTRACTS, JUNE 1976

tal consequences, particularly in relation to other fossil fuel resources. The impact on air quality stems principally from the emission of particulates into the atmosphere during gas production operations. Vapor vented from storage tanks and burning of waste products containing sulfur compounds are the major problems.

59489

APTIC NO. 73327

Osaka Municipal Government (Japan), Promotion Committee
for Countermeasures Against Automobile Exhaust

COUNTERMEASURES AGAINST AUTOMOBILE EXHAUST IN OSAKA. (*Osaka ni okeru jidosha haigasutaisaku no ayumi*). Text in Japanese. 181 p., May 1974.

Measurements of carbon monoxide concentrations in Osaka for 1972 showed that at the Shinzaibashi intersection 18.2% of the total measurements gave 1-hour average concentrations higher than 10 ppm for 24 consecutive hours. At the Ebienishi primary school, 10.5% of the total measurements gave the same. At most of the locations investigated, more than 90% of the total measurements gave 24-hour averages for nitrogen dioxide higher than 0.029 ppm. The highest daily concentrations of hydrocarbons (as propane) ranged from 1.70 ppm to 5.12 ppm. The promotion committee was established in 1968 by the government agencies and 16 private organizations. The major activities of the committee are introduction and promotion of automobile exhaust countermeasures. Measures adopted by the Big Plan in Osaka prefecture and Clean Air Plan at Osaka city included: long-term general planning for improvement of road conditions; promoting smooth traffic flow and city redevelopment; developments of a new transportation system, technology for energy conversion, and improvement of automobile engine structure; enforcement of emission regulations based on the Muskie law and promotion of a low pollution automobile; expansion of air pollution monitoring networks and enforcement of oxidants emergency countermeasures; investigation of the ecological effects of automobile exhausts; and introduction of an emergency traffic control plan.

59490

APTIC NO. 73498

Federal Energy Administration, Washington, D. C.,
Interagency Task Force on Synthetic Fuels from Coal

PROJECT INDEPENDENCE BLUEPRINT: SYNTHETIC FUELS FROM COAL (FINAL REPORT). 365p., Nov. 1974. 24 refs.
GPO

The environmental effects of the production of synthetic fuel from coal were determined. The major air pollutants from coal conversion processes are particulate matter, sulfur oxides, reduced sulfur compounds, nitrogen oxides, hydrocarbons, carbon monoxide, trace metals, odors, and other gases including ammonia, hydrogen cyanide, and nitrogen chloride. The most significant atmospheric emissions from coal preparation results from the operation of the thermal dryers. In the absence of proper controls, particulates in the form of fine coal dust and ash from coal combustion together with the products of combustion, NO_x and SO_x may be released. In the production of both high and low-Btu gas, air emissions include sulfur compounds, mainly sulfur dioxide, emanating from Claus plant tail gases. Typical emissions from coal liquefaction processes contain NO_x and CO obtained from consumption of coal in the process as well as particulate matter and some hydrocarbons. The potential production capabilities of the synthetic fuels industry and the resources necessary to achieve these levels of production were estimated.

59491

APTIC NO. 75989

Industrial Gas Cleaning Inst., Inc., Stamford, Conn.

AIR POLLUTION CONTROL TECHNOLOGY AND COSTS: SEVEN SELECTED EMISSION SOURCES. KRAFT MILL RECOVERY BOILERS, FERROALLOY FURNACES, FEED AND GRAIN PROCESSING, GLASS MELTING FURNACES, CRUSHED STONE

CONTROL METHODS

AND AGGREGATE INDUSTRY, ASPHALT SATURATORS, INDUSTRIAL SURFACE COATINGS (FINAL REPORT). Office of Air and Waste Management Contract 68-02-1091, Rept. EPA-450/3-74-060, 339p., Dec. 1974. 35 refs.

NTIS: PB 245065/AS

Information on process variables, air pollution control requirements, and capital and operating costs for abatement equipment is analyzed for the following seven selected emission sources: kraft mill recovery boilers, ferroalloy furnaces, feed and grain processing operations, glass melting furnaces, crushed stone aggregate industry, asphalt saturators, and industrial surface coating operations. Types of abatement equipment selected for the analysis include: electrostatic precipitators, fabric filters, wet scrubbers, thermal incinerators, high energy particulate air filters, catalytic incinerators, and carbon adsorbers. Each abatement device is analyzed in terms of two performance levels, viz., high efficiency and medium efficiency, in order to relate costs to the degree of emission reduction as well as to gas handling capacity.

59492

APTIC NO. 76209

Environmental Protection Agency, Washington, D. C., Office of Research and Development

LIME/LIMESTONE WET-SCRUBBING TEST RESULTS AT THE EPA ALKALI SCRUBBING TEST FACILITY (PROGRESS REPORT). 15p., 1974.

Three wet scrubber systems for removing sulfur dioxide and fly ash from coal fired boiler flue gases: a Turbulent Contact Absorber (TCA), a venturi followed by a spray tower, and a Marble Bed Absorber, were tested to define regions of scale free operation, to determine the effects of variables such as liquid-to-gas ratio and gas velocity, and for reliability. Lime and limestone reliability tests were conducted on the venturi/spray tower and TCA systems, respectively. Scrubber internals can remain relatively scale free if the scrubber liquor sulfate saturation stays below about 135%. This can be accomplished by proper slurry solids concentration, effluent residence time, and liquid to gas ratio. The mist elimination configuration in the TCA handled the problem of mist eliminator scaling and plugging, the most significant reliability problem encountered, successfully. The wash tray is followed by a chevron mist eliminator, both continuously washed on the underside. The system remained essentially clean for 3 mo when the TCA operated in a closed liquor loop at 8.6 ft/sec superficial gas velocity and 15% slurry solids concentration. The venturi/spray tower mist elimination configuration consists of a chevron mist eliminator with provision for underside and top-side washing. Scale formation on the top vanes was a constant problem at 6.7 ft/sec superficial gas velocity and 8% slurry solids concentration. Underside washing alone did not eliminate the problem. When underside washing was combined with intermittent high pressure topside washing of one section, it remained essentially scale free. Operating experience is described for closed liquor loop operation, hot gas/liquid interface, reheaters, fans, pumps, linings, waste solids handling, and instruments. (Author abstract modified)

59493

APTIC NO. 79982

TECHNIQUE FOR AIR CLEANING WITH SOLVENT RECOVERY: ADSORPTION ON ACTIVATED CARBON. (Tecniche di depurazione dell'aria con recupero di solventi: adsorbimento su carbone attivo). Text in Italian. Inquinamento, no. 11:39-42, Nov. 16, 1974.

In an activated carbon recovery system, the air charged with solvents is sent to a bed of activated carbon where the solvent molecules are retained while the cleaned air is released into the atmosphere. When the carbon becomes saturated, the adsorbed solvent is desorbed by heating the carbon with steam. Meanwhile, the air flux is directed into another adsorber. The process can be utilized wherever hydrocarbons in a gaseous state have to be separated from an air current. It should be

used whenever a solvent is employed as an intermediate in production. When planning the installation of an activated carbon system, it should be noted that the cost will depend on the characteristics of the air to be treated, and that construction materials will depend largely on the solvents. Reduction of the number of solvents to a minimum and elimination of water soluble solvents, especially those which form a mixture with water and other components at a constant ebullience is recommended. The utilization of a single solvent which is not affected by the catalytic effect of the carbon and which is insoluble in water offers the best solution in terms of recovery.

59494

APTIC NO. 80050

ENVIRONMENT RESTORATION. (Kankyo Kaizen). Text in Japanese. Toshiba Rebyu (Toshiba Rev.), 29(3):220-223, 1974.

A review of Toshiba's products and programs related to environmental safety is presented. Their products include water cleaning systems, sewage systems, municipal garbage treatment plants, and various water and air pollution control systems. Toshiba has also developed source monitoring systems for air pollution, of water pollution, noise, vibration, and odor. Because of the large scale of such systems and the need for prompt communication of analyzed data, telemetry and computerized data analysis are fully utilized in all Toshiba products.

59495

APTIC NO. 80277

Environmental Protection Agency, Washington, D. C.

FLUE GAS DESULFURIZATION AND SULFURIC ACID PRODUCTION VIA MAGNESIA SCRUBBING. Rept. EPA-625/2-75-007, 22p., 1974.

A prototype flue gas desulfurization plant operated from April 1972 to June 1974 on a 155 megawatt boiler. The system's ability to regenerate and reuse magnesium oxide was demonstrated and over 5000 tons of sulfuric acid were produced and sold. The scrubbing system demonstrated a consistent ability to achieve SO₂ removal efficiencies in excess of 90% using regenerated MgO. The magnesium slurry process can be generally split into two areas: SO₂ scrubbing, slurry dewatering, and magnesium sulfite drying; and MgO regeneration and H₂SO₄ production. The SO₂ recovery is described. Chemical plant operations convert the MgSO₃-MgSO₄ mixture received from the power plant back into MgO for recycle. The SO₂ produced from regeneration is cleaned, cooled, and dried for an H₂SO₄ plant. The chemical and mechanical performance of the scrubbing system itself was excellent. Initial operating problems in the chemical plant are discussed. Magnesium oxide losses were excessive during the early period of operation due primarily to spills and required cleanouts caused by the solids handling problems. The economics of flue gas desulfurization with magnesia and the subsequent production of sulfuric acid are complex issues and vary widely with the availability of nearby markets for sulfuric acid, as well as the price differential between high and low sulfur fuels. The economics of a large scale arrangement are examined. This technology has special application in geographical areas near sulfuric acid markets and where land availability is limited for the disposal of sludges produced from throwaway flue gas desulfurization processing.

59496

APTIC NO. 82464

DECENTRALIZE YOUR ODOR CONTROL. Water Sewage Works, 121(10): 60-62, Oct. 1974.

A hydrogen peroxide system for the control of odors in the Sunrise, Florida, wastewater collection system is described. The odor is caused by hydrogen sulfide, a frequent by-product of waste collection and treatment systems. It can be dangerously toxic. In a sewer environment, H₂S is often converted into sulfuric acid which erodes the collection and treat-

ment system. The City of Sunrise waste collection system consists of gravity mains, lift stations, and force mains. Hydrogen peroxide is injected into the collection system at lift stations ahead of where the problem is first detected. The dose of hydrogen peroxide is adjusted to overcome the odor problem at the lift station and to prevent it from recurring. The H₂S and its odor were eliminated at the three lift stations.

1973

59497

APTIC NO. 67090

Arnold, James P., Fritz Freyn, Bruno Schukoff, Gerhard Thien, and Edwin C. Kienzie

SMALL, HIGH-SPEED, AIR-COOLED DIESEL ENGINES FOR MILITARY AND INDUSTRIAL APPLICATIONS.

Preprint, Society of Automotive Engineers, Inc., New York, 22p., 1973. 6 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Fuels and Lubricants Meetings, Milwaukee, Wis., Sept. 10-13, 1973, Paper 730845.)

The military requirement for a lightweight, air-cooled compression ignition engine family having two members, specifically 10 and 20 hp versions at the rated speed of 3600 rpm, is discussed. Design and preliminary development programs for such an engine family were completed, and specifics are related. Development of a practical combustion system for the high rated speed was feasible and is demonstrated on the basis of test data. Endurance data to date indicate that the design life of 6000 hr between major overhauls will be attainable. The plan for the future includes additional testing of updated prototype engines as well as further investigations of noise reduction and control of harmful exhaust emissions. Although the 2-cycle engine had some minor reductions in emissions, a suitable injection pump with load as well as speed-sensitive timing control would have to be developed before much improvement in emission characteristics could be expected. Emission values for 3600 rpm for hydrocarbons plus nitrogen dioxide for 17 and 10 hp versions of the engine in g/hp/hr were 19 and 29 at 25% load, 13.5 and 17.5 at 50%, 12.7 and 14.0 at 75%, and 12.5 and 13 at 100%, respectively. (Author abstract modified)

59498

APTIC NO. 81929

Belt, Robert J. and Michael M. Roder

LOW SULFUR FUEL BY PRESSURIZED ENTRAINMENT CARBONIZATION OF COAL. *Advan. Chem. Ser.*, no. 127:121-134, 1973. 4 refs. (Presented at the American Chemical Society, Division of Fuel Chemistry and Division of Petroleum Chemistry, Meeting, 164th, New York, Aug. 29-30, 1972.)

Coal containing 2.5% sulfur was processed into a char containing 0.7% sulfur by pressure carbonization of the coal at 1900 F and 400 psig in a gas consisting of 91% hydrogen and 9% nitrogen. The temperature, pressure, and hydrogen content of the entraining gas influenced the total and organic sulfur content of the char as well as the sulfur content per unit heating value; whereas only the temperature and pressure affected the pyritic sulfur content of the char. Sulfate sulfur was unaffected by any of the three variables. Relatively low carbonization temperatures produced a char with a high volatile-matter content, and vice-versa. Char yield decreased with an increase in temperature, while pressure and hydrogen concentration exerted no effect on char yield. The char heating value was virtually the same at all conditions. A mathematical model for predicting the sulfur content of chars produced over a specified range of operating conditions revealed that a char containing less than 0.7% sulfur can probably be produced at temperatures and pressures higher than those investigated. (Author abstract modified)

AIR POLLUTION ABSTRACTS, JUNE 1976

59499

APTIC NO. 73565

Blakey, P. B.

PROCESS ODOUR CONTROL BY CATALYTIC OXIDATION. In: *Industrial Pollution Control*. Keith Tearle (ed.), London, Business Books Ltd., 1973, Chapt. 13, p. 143-157.

The use of catalytic oxidation to control odor emissions is discussed in terms of theoretical consideration and case histories. A typical catalytic afterburner is illustrated which incorporates a honeycomb oxidation catalyst with a heat exchanger in the same vessel. The heat exchanger is so designed that the cold outer surface of the afterburner does not cause undesirable temperature drops in the gas passing to the catalyst chamber. The application of such catalytic units is illustrated for the removal of odors from food and feed processing operations, plastics manufacturing, production line painting, printing operations, and the stripping of hydrocarbons from liquid stream at biological treatment plants. Odor control efficiencies as high as 99% are reported.

59500

APTIC NO. 84313

Bolton, M. S. and J. Swithenbank

ON-LINE ENGINE TUNING FOR EXHAUST EMISSION CONTROL. *J. Automotive Eng.*, 4(4):18-22, Aug. 1973.

The feasibility of a feedback control system for carburetors to maintain the air-fuel ratio at a constant level despite changes in operating conditions and despite component wear was investigated. A suitable simple detector was developed and used for closed loop control. It is effective for correcting errors in the air-fuel ratio using a gas carburetor. Controllers are under development for gasoline carburetors. The general technique favored is adjusting the pressure above the gasoline in the float chamber. The detector system is being tested on a vehicle to determine its effective operating life. (Author conclusions modified)

59501

APTIC NO. 84474

Brun-Labarre, Evelyne

COMBUSTION OF LIQUID RESIDUES AND SLUDGES IN CINCLUS INCINERATOR FURNACES.

(Combustion des residus liquides et boueux dans les fours d'incineration Cinclus). Text in French. *Ind. Petrole*, no. 446:29-34, Dec. 1973.

The direct incineration Cinclus furnace is based on emulsion combustion. Most of the liquid wastes or sludges are gasified and moved by purely aerodynamic means within the combustion chamber. The need for a well-divided and homogeneous material is answered by the preliminary emulsion of the residues. The latter process as well as ternary mixtures are effected at the point of injection into the furnace. Maximum combustion of the fuel alone is achieved at the front of the furnace with a 23% decrease in temperature (0.77 yield). With the injection of water, maximum temperature is achieved at the back of the furnace with a yield of 0.85 and 0.90. Through the control of the aerothermal external recirculation phenomena of the gaseous combustibles, the spatial distribution of oxidation and thermal transfer are in equilibrium. This homogenization of the thermal levels in the reaction chamber produces an optimal temperature in the largest possible area. Recirculation currents return to the cold injection aperture. When the exhaust carbon and nitrogen gases and water are in acceptable quantities, their spread into the atmosphere and their distribution over the ground are studied. If they are in polluting quantities, they must be captured before release into the atmosphere. The smoke enthalpy can be recovered and used either by means of an autonomous incineration unit (recovery where the products enter the furnace and at the utilities) or an integrated incineration unit (recovery same as above as well as the level of the production unit). Thermal destruction can be used for highly polluting liquid wastes and residues for which combustion does not create any thermal problems but the behavior of which, at high temperatures, raises some difficulties, and to aqueous phase liquids or

CONTROL METHODS

59507

sludges which do not contain enough organic matter to reduce an autohprocess of combustion.

59502

APTIC NO. 76432

Cass, Glen R.

COST AND PERFORMANCE OF AUTOMOTIVE EMISSION CONTROL TECHNOLOGIES. *California Inst. of Tech., Pasadena, Environmental Quality Lab., National Science Foundation Grant GI-29726, Rept. EQL-7, 31p., Dec. 1973. 8 refs.*

A cost and performance analysis of near-term automotive emission control technologies is presented. The best proven emission control performance of a catalyst-equipped conventional engine with exhaust gas recirculation can be equalled or bettered by at least one version of diesel, Wankel, or stratified-charge engine designs. The Wankel engine at its current state of commercial development appears to be unattractive, however, due to its poor fuel economy. Hydrocarbon, carbon monoxide, and nitrogen oxide emission standards of 0.41, 3.4, and 1.5 g/mi, respectively, can probably just barely be met by a conventional engine with oxidation catalyst and exhaust gas recirculation. The Wankel engine with a thermal reactor and uncontrolled stratified charge and diesel engines are also capable of just meeting the e standards. The lowest cost alternative engine technology for a specific emission standard cannot be conclusively determined since the collected margin of error involved in the assumptions made to determine annualized cost of ownership is probably larger than the differences in cost due to emission control technology between the closest competitive solutions.

59503

APTIC NO. 81928

Chappell, G. A.

AQUEOUS SCRUBBING OF NITROGEN OXIDES FROM STACK GASES. *Advan. Chem. Ser., no. 127:206-217, 1973. 5 refs. (Presented at the American Chemical Society, Division of Fuel Chemistry and Division of Petroleum Chemistry, Meeting, 164th, New York, Aug. 29-30, 1972.)*

The effectiveness of various aqueous solvents for the scrubbing of nitrogen oxides from flue gases is reviewed. Concentrated aqueous amine solutions are very effective for the removal of NO_x from flue gases not containing sulfur dioxide, with aqueous ammonia and 2-aminoethanol absorbing 74 and 48%, respectively, of the nitric oxide in flue gases. Sulfite solutions are excellent nitrogen dioxide absorbents but poor NO absorbents. Slurries of calcium hydroxide, magnesium hydroxide, and zinc hydroxide are not efficient for removing NO and NO₂ from flue gas not containing SO₂. Alkaline hydroxide slurries and solutions are effective NO₂ absorbers if SO₂ is present in the flue gas. The sulfite formed during SO₂ absorption enhances NO₂ removal. Magnesium hydroxide slurry absorbs 58% of the NO₂ and 100% of the SO₂ from flue gas containing 830 ppm NO₂ and 2460 ppm SO₂. Nitrogen dioxide removal is enhanced by the addition of an anti-oxidant such as hydroquinone to the scrubber. Combined NO_x-SO_x absorption is possible provided the NO in the flue gas can be oxidized to NO₂ upstream from the scrubber. (Author abstract modified)

59504

APTIC NO. 83659

Chard, N. T. J. and F. G. Turner

THE ANOMALOUS BEHAVIOUR OF AIR FILTERS. *Filtration Separation (Purley), vol. 1973: 701-705, Nov./Dec. 1973. (Presented at the Filtration Society Symposium in Filtration in the Automobile Industry, Leamington Spa, England, May 8, 1973.)*

The behavior and selection of air filters for separating dust from an incoming air stream are discussed. The behavior of any type of filter exposed to a particular set of conditions is generally unpredictable; performance guidelines are obtained by the use of realistic test methods. The performance of any filter operated in a free-field dust environment is dependent

upon the flow rate. For inertia type filters the gravimetric efficiency is sensitive to the ratio of the scavenge flow employed. The performance of all filters is time-dependent and the effects of orientation should not be neglected. Before the selection of a filter for a particular duty is made, care is needed to ensure that all aspects of the equipment are examined. The particle size distribution established for British Standard no. 1701 coarse grade test dust is entirely satisfactory for the test purposes within the scope of the research undertaken for most applications. (Author conclusions modified)

59505

APTIC NO. 81812

Cooper, Barry J.

AUTOMOBILE EMISSION CONTROL CATALYSTS.

Chem. Ind. (London), no. 19:926-928, Oct. 6, 1973. 3 refs.

The design of automobile emission control catalysts capable of meeting 1976 Federal emission standards is discussed. The required nitric oxide emission levels can be met by catalytic systems only if two catalysts are employed in the exhaust system; the first works in a reducing environment to remove NO, and the second is an oxidation catalyst for the removal of hydrocarbons and carbon monoxide. The reduction catalyst must produce a minimal amount of ammonia since this is oxidized back to NO over the oxidation catalyst. Suitable catalyst systems can be produced using platinum metals as the active agents. The catalysts consist of a three phase system comprising a ceramic honeycomb substrate, a high-area washcoat, and platinum mixed with other elements which promote its activity. Such catalysts are capable of reducing CO, hydrocarbon, and nitric oxide emissions to 0.85, 0.11, and 1.65 g/mi (with exhaust gas recirculation). Durability tests indicate a distance of 20,000 mi with gasoline containing 0.03 g/gallon of lead.

59506

APTIC NO. 79818

Doerschlog, Christian

STURGIS FOUNDRY INSTALLS UNUSUAL POLLUTION CONTROL SYSTEM. *Mod. Casting, 63(10):42-43, Oct. 1973.*

A pollution control system is described based on drawing cupola offgases through a series of tiles containing slots or openings. These slots are shaped so that the pressure energy of the gases is converted to centrifugal force, multiplied many times. The energy conversion separates and collects particles well into the submicron range. A small amount of water is used to carry collected particles away. Pressure loss in this collector at maximum efficiency is well below that required for other high efficiency wet collectors, resulting in a 50 to 70% reduction in required energy. The tiles with their slots can be arranged in various ways to suit construction requirements. Collector installation consists of a short crossover duct which connects to a quenching column where water spray cools gases to saturation. Saturated gases are then conducted to the collector where particulate matter is separated by passage through the layers of tiles. A water spray, relatively coarse and with low volume, washes the tiles and carries collected particulates away. A short duct connects the exhauster with the scrubber and the stack carries the cleaned gases into the atmosphere. Water from both quench column and collector goes through a separator. Dewatered granulated slag and concentrated collector dust go into a hopper at the discharge end. Cleaned water returns to a small storage tank for reuse in the system. The system is expected to allow 0.15 lb of particulate/1000 lb of air.

59507

APTIC NO. 67093

Emukai, Naomi and Nobuo Inagaki

H₂S and SO₂ REMOVAL BY CHARCOAL FILTERING.

Rev. Elect. Commun. Lab., 21(5-6):384-390, May-June 1973. 3 refs.

In order to determine the efficiency and optimum application condition of charcoal filtering, the effects of various factors,

such as filter thickness and humidity, on the purification ratio were investigated in a study of hydrogen sulfide and sulfur dioxide removal by charcoal filtering. The H₂S and SO₂ reaction mechanism and kinetics at the charcoal surface are discussed. The catalytic chemical reaction probably occurs in an SO₂ environment, following the SO₂ dissolving in the water condensed in the pores; the reaction rate is determined by the SO₂ diffusion through the water. The H₂S reaction is probably chemisorption. According to this point of view, the effects of the humidity, air flow through the filter, and dust on the purification ratio are successfully explained. (Author abstract modified)

59508

APTIC NO. 81846

Enneking, Joseph C.

CONTROL VAPOR EMISSIONS BY ADSORPTION.

American Society of Heating, Refrigerating, and Air Conditioning Engineers, ASHRAE (Am. Soc. Heating, Refrig., Air Cond. Engrs. Air Pollut. Control Symp., Part 2, Semi-annu. Meet., Chicago, Ill., 1973, p. 20-24. (Jan. 28-Feb. 1.)

The use of activated carbon adsorption to control vaporous and odorous emissions is discussed. Typical applications for activated carbon control systems include: gasoline vapor recovery from gasoline tanks and carburetors, the printing industry, and coating operations involving solvents and paint products. If the concentration of the contaminant is lower than 1 ppm, the problem is usually one of odor removal, and a relatively thin bed of activated carbon is capable of reducing the odor below its threshold for a year or more. If the organic contaminant is present at a concentration between 0.1% by volume and the lower explosive limit, a conventional solvent recovery system with relatively deep beds of activated carbon is required.

59509

APTIC NO. 80261

Gnyp, A. W., S. J. W. Price, C. C. St. Pierre, D. Mozzon, and D. Smith

AN EVALUATION OF WET COLLECTOR PERFORMANCE FOR PARTICULATE REMOVAL. PART I: FUNDAMENTALS. Preprint, Windsor, Univ. (Canada), Industrial Research Inst., 114p., 1973. 82 refs.

Background materials is presented for the evaluation of wet gas cleaning devices. A preliminary literature survey indicated that a systematic evaluation of wet collector performance would depend on a thorough appreciation of the fundamentals of particulate collection by cylindrical obstructions suspended in particle-laden gas streams. Fundamental principles of fluid and particle dynamics are presented. Although inertial impaction is the mechanism primarily responsible for particulate collection in wet scrubbers, the contributions to particulate removal made by interception and diffusional effects are also considered. An analysis of fluid flow past immersed cylinders and spheres shows that significant capture of fine material could be expected on the backside of liquid drops in wet scrubbers. (Author abstract modified)

59510

APTIC NO. 81821

Gogineni, M. R., W. C. Taylor, A. L. Plumley, and James Jonakin

WET SCRUBBING OF SULFUR OXIDES FROM FLUE GASES. *Advan. Chem. Ser., no. 127:135-151, 1973. 9 refs. (Presented at the American Chemical Society, Division of Fuel Chemistry and Division of Petroleum Chemistry, Meeting, 164th, New York, Aug. 29-30, 1972.)*

Laboratory and field studies of wet scrubbing techniques for the removal of sulfur dioxide from flue gases are described, with particular emphasis on lime/limestone processes. The controlling chemical reaction for lime/limestone wet scrubbing SO₂ removal systems is the formation of calcium bisulfite from calcium sulfite and SO₂. The control of sulfite scaling requires that a minimum amount of free hydroxide ion be recirculated to the scrubber. Calcium sulfate scaling can be

avoided by the circulation of 1-5% gypsum seed crystals. Marble beds are good vapor-liquid contactors for lime/limestone scrubbing and demonstrate a tray efficiency of 90-95%. Both tail-end and furnace injection lime/limestone systems are being operated successfully on utility steam generators. Land fill and impounding are currently being used for waste disposal (Author abstract modified)

59511

APTIC NO. 81823

Hamersma, J. W., M. L. Kraft, E. P. Koutsoukas, and R. A. Meyers

CHEMICAL REMOVAL OF PYRITIC SULFUR FROM COAL. *Advan. Chem. Ser., no. 127:69-79, 1973. 12 refs. (Presented at the American Chemical Society, Division of Fuel Chemistry and Division of Petroleum Chemistry, Meeting, 164th, New York, Aug. 29-30, 1972.)*

The Meyers process for the chemical removal of pyritic sulfur from coal is described. The process is based on the observation that aqueous ferric salts selectively oxidize the pyritic sulfur in coal to chemical forms which can be removed by vaporization, steam, or solvent extraction. Both ferric chloride and ferric sulfate can be used with good results; although the latter is less corrosive, makes regeneration less complicated, and allows for the more economical removal of residual leach solution. The process is capable of removing from 40-75% of the total sulfur in coal, corresponding to nearly 100% of the pyritic sulfur. Higher ranked Appalachian coals react to a lesser extent with ferric ion under all experimental conditions than do the lower ranked eastern interior coals. Pyrite removal generally increases for smaller top sizes because of exposure to pyrite encapsulated within the coal matrix.

59512

APTIC NO. 67083

Henry, J. M., C. R. McCann, J. J. Demeter, and D. Bienstock

NOX CONTROL BY FLUE GAS RECIRCULATION IN PULVERIZED FUEL COMBUSTION. *Preprint, American Inst. of Chemical Engineers, New York, 12p., 1973. 8 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 66th, Philadelphia, Pa., Nov. 11-15, 1973.)*

Experiments on flue gas recirculation in a pulverized fuel furnace are discussed. The recirculation was effective in reducing nitrogen oxide emissions. The furnace burned 500 lbs of coal/hr and simulated the operation of large industrial and utility boilers. Flue gas was cooled to 350 F and recirculated into the flame zone in the range of 7 to 33% of the input air supply. Nitrogen oxide emissions with no flue gas recirculation were 1.44 g/lb to the 6th power cal (calculated as nitrogen dioxide); with recirculation, reductions of 6-44% NOx emissions were observed. A mathematical model of the NOx chemistry of the furnace was examined in parallel with the experiments to determine the sensitivity of NOx emissions to flue gas recirculation. The observed emission reduction was much less than predicted by the kinetics of atmospheric nitrogen oxidation at flame temperatures. (Author abstract modified)

59513

APTIC NO. 67108

Hodgson, J. N. and A. H. Kreeger

DESIGN AND DEMONSTRATION OF LOW EMISSION RANKINE CYCLE AUTOMOTIVE ENGINE USING ORGANIC WORKING FLUID AND TURBINE EXPANDER. *Aerojet Liquid Rocket Co., Sacramento, Calif., Environmental Protection Agency Contract 68-04-0005, 10p., 1973. (Presented at the Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., Aug. 13-17, 1973.)*

The design and demonstration of low emission Rankine cycle automobile engine using organic working fluid and turbine expander are described. A supercritical thermodynamic cycle provides system stability and temperature uniformity for improved engine reliability. External combustion allows control

over the heat input process to minimize exhaust pollutants. A preprototype engine configured to fit in a 1973 Chevrolet Impala was built and tested. Emission levels averaged about one-fourth of the 1975-1976 Federal Standards. Predictions for the prototype engine in a vehicle indicate fuel economy and performance equivalent to current automotive engines. (Author abstract modified)

59514

APTIC NO. 81619

Hoffmann, Gerd W. and Otto Meyer

PRACTICAL EXPERIENCE IN THE DEDUSTING OF WASTE GASES CONTAINING CO FROM TOP-BLOWING OXYGEN CONVERTERS USING DRY ELECTROSTATIC PRECIPITATORS. (*Betriebliche Erfahrungen mit der Entstaubung kohlenmonoxidhaltiger Abgase aus Sauerstoffaufblaskonvertern mit Trockenelektrofilter.*) Text in German. *Stahl Eisen* (Duesseldorf), 93(20):905-910, Sept. 27, 1973.

Several processes were available for cleaning waste gases of a steelworks, including a combination of full combustion or minimum gas methods, and dry electrostatic precipitators or wet scrubbers. The decision was taken in favor of a minimum gas process followed by cleaning in a dry electrostatic precipitator. Trials with a tube-type dry electrostatic precipitator did not yield satisfactory results, and a three-stage plate type dry electrostatic precipitator was therefore selected. The dedusting facilities of the converters differed regarding cooling section and the position of the crude gas connection line. It was possible to demonstrate the influence of temperature and hydrogen content on the explosion limits. As the carbon monoxide content increased, the water-gas reaction raised the proportion of hydrogen to depress the explosion boundary. The clean gas dust content of the two plants, 85 mg/N cu m, was lower than the required content of 150 mg/N cu m. The separation factor of the dedusting facility proper was 99.95%. (Author abstract)

59515

APTIC NO. 83455

Hoffmann, Gerd W. and Otto Meyer

PRACTICAL EXPERIENCE IN THE DEDUSTING OF WASTE GASES CONTAINING CO FROM TOP-BLOWING OXYGEN CONVERTERS USING DRY ELECTROSTATIC PRECIPITATORS. (*Betriebliche Erfahrungen mit der Entstaubung kohlenmonoxidhaltiger Abgase aus Sauerstoffaufblaskonvertern mit Trockenelektrofilter.*) Text in German. *Stahl Eisen* (Duesseldorf), 93(20):905-910, 1973.

Considerations regarding the selection of gas cleaning processes for oxygen converters are presented. Trials with a tube-type dry electrostatic precipitator yielded negative results. A description is given of the present minimum gas system for gas collection and dedusting with three-stage electrostatic precipitators at converters C and A of the Peine-Salzgitter steelworks. Converter gas volume and curves for waste gas analysis as a function of the decarburization rate are given, as are the influence of temperature and hydrogen content on explosion limits, velocity distribution at the cooler inlet, and clean gas dust content.

59516

APTIC NO. 84428

Jackson, W. J.

RAPID DECARBURIZATION OF LIQUID STEEL WITHOUT EMISSION OF BROWN FUME. *American Inst. of Mining, Metallurgical, and Petroleum Engineers, Electr. Furn. Conf. Proc.*, 31st, Cincinnati, Ohio, 1973, p. 86-92. 10 refs. (Dec. 5-7.)

The application of the fumeless refining process for carbon and low alloy steels is described. Rapid decarburization is achieved by injecting millscale and other forms of oxide into the bath, while maintaining freedom from the emission of brown fume. Carbon removal rates approach those obtained with oxygen lancing. Hydrogen and nitrogen are reduced to satisfactory levels. Low values of phosphorus are attained and

chromium and manganese are removed to low levels. Losses of chromium from stainless steel heats are high. (Author conclusions modified)

59517

APTIC NO. 81824

Johnson, Axel R., Ronald H. Wolk, Raymond F. Hippeli, and Govanon Nongbri

H-OIL DESULFURIZATION OF HEAVY FUELS. *Advan. Chem. Ser.*, no. 127:105-120, 1973. 5 refs. (Presented at the American Chemical Society, Division of Fuel Chemistry and Division of Petroleum Chemistry, Meeting, 164th, New York, Aug. 29-30, 1972.)

The H-Oil process for the desulfurization of residual oils is described. The process allows for the production of fuel oils with a 0.3% sulfur content from a range of feedstocks encompassing most of the commercially important residues. The major difference between the H-Oil and other processes for the production of low sulfur fuels is a reactor system in which the oil and hydrogen are passed upflow through the reactor at a velocity sufficient to maintain the catalyst in a suspended or ebullated state. The reactor system is isothermal and is not susceptible to pressure drop buildup from suspended materials contained in the feed. Also, the catalyst can be added and withdrawn during operation to maintain a constant level of catalyst activity. The desulfurization process is represented by a pseudo second-order kinetic model. Problems of low level sulfur content and catalyst aging are eliminated by using a multi-stage reactor approach with backstaging of the catalyst on a daily addition basis.

59518

APTIC NO. 67110

Jones, Robert E.

ADVANCED TECHNOLOGY FOR REDUCING AIRCRAFT ENGINE POLLUTION. Preprint, *American Society of Mechanical Engineers*, 21p., 1973. 16 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Detroit, Mich., Nov. 11-15, 1973.)

Combustor research programs of the National Aeronautics and Space Administration are described in relation to proposed Environmental Protection Agency regulations covering emissions from aircraft gas turbine engines. In-house research with a swirl-can modular combustor and a double-annular combustor demonstrates significant reductions in nitrogen oxide levels. Research on the reduction of idle emissions includes the conversion of conventional duplex fuel nozzles to air-assisted nozzles and an exploration of the potential improvements possible with fuel staging and variable combustor geometry. A major contracted effort is the Experimental Clean Combustor Program, the objective of which is to evaluate the potential emissions reduction of a wide variety of combustor designs; the program goal is a 75% or greater reduction in NOx emissions at take-off and a 50% reduction in the level of idle pollutants from present day levels for large turbofan engines. This effort is planned to be conducted in three phases consisting of combustor concept screening, combustor development, and full engine demonstration of the emissions reduction possible. (Author summary modified)

59519

APTIC NO. 82705

Khvan, E. A., P. V. Lisovskiy, B. F. Sadovskiy, and Y. K. Shaposhnikov

CATALYTIC AFTERBURNING FOR WASTE AIR CLEANING IN FISH CANNERIES. (*Kataliticheskoe dozhiganie v tselyakh ochistki otrabotannogo vozdukh na rybokonservnykh zavodakh.*) Text in Russian. *Rybn. Khoz.* (Moscow), 49(8):60-61, 1973.

The possibility of using chemical catalysts to remove unpleasant odors arising during the operation of steam-oil burners was investigated using a laboratory model of an apparatus for catalytic afterburning in a fish cannery. The special catalysts used were models ShPK-2, ShPK-0.5, and MKh-7.

All of them allowed for sufficient removal from the air of organic substances emitted during fish frying. On the basis of the findings, an industrial device calculated at an air cleaning rate of 1000 cu m of air per hour would require an air temperature of 350 C at the entrance to the reactor, a volumetric rate of 10,000/hr, and 0.1 cu m (90 kg) for the catalyst. The least expensive of the tested catalysts, model MKh-7, meets these requirements.

59520

APTIC NO. 84397

Konieczynski, J., S. Krocak, and J. Kobylski

MOBILE EXPERIMENTAL STATION FOR NEUTRALIZATION OF GASES. (*Przewozna stacja doswiadczalna do neutralizacji gazow*). *Air Conserv.* (English translation from Polish of: *Ochrona Powietrza*), 7(5):38-48, 1973. 9 refs.

NTIS: TT 73-54096/5

A mobile experimental station mounted on a truck trailer was designed for investigating removal of harmful gaseous pollutants from industrial gases. Technical data, principles of operation, and characteristics of eight assemblies based on three basic physicochemical methods; absorption, adsorption, and catalysis are presented. These mobile stations allow for neutralization of gases in the various fields of industry, especially in the chemical, nonferrous metal, metallurgical, machine, and metal products; optimization of gas neutralizing processes both by increasing the efficiency of the processes and by lowering their costs; and conducting tests and experiments with new appliances for neutralizing gases. (Author conclusions modified)

59521

APTIC NO. 79749

Krizek, J. and J. Kraft

THE EMISSION OF NITROGEN OXIDES IN THE METAL INDUSTRY AND POSSIBILITIES OF ITS REDUCTION. (*Emise kyslicniku dusiku v kovoprumsylu a moznosti jejich omezeni*). *Text in Czech. Cesk. Hyg.*, 18(2):96-100, Feb. 1973. 9 refs.

Emission of gaseous nitrogen oxides by small sources such as metal pickling plants is discussed. Although small, such sources are capable of creating significant concentrations of toxic pollutants near the ground surface, primarily because the level of their exhaust is low. The content of nitrogen oxides in the emissions of such plants may be drastically reduced by taking advantage of the fact that the first (transient) stage in reaction between any metal and nitric acid is oxidation of the metal which produces nitrous acid. Hence addition of any chemical which reacts with this acid to the pickling bath greatly reduces the eventual emission of nitrogen oxides. The method is simple and inexpensive because it requires only minor modifications of the pickling process and equipment. Measurements obtained at five different plants which had such equipment installed during 1966-1970 revealed an effectiveness of reduction of emitted nitrogen oxides of 90-99% under normal operational conditions.

59522

APTIC NO. 76207

Krylenko, V. I., S. M. Belokon, and V. V. Kormyshev

REMOVAL OF SULFUR DIOXIDE FROM SINTERING INDUSTRY GASES. (*Ochistka gazov aglomeratsionnogo proizvodstva ot sernistogo ангидрида*). *Text in Russian. Metallurg.*, no. 9:37-38, 1973.

An experimental scrubber developed to increase the efficiency of sulfur dioxide separation from ore dressing plant-generated flue gases is described. The flue gas is admitted at the top of the scrubbing tower where lime suspension is added through nozzles at a rate of 3-6 l/cu m of gas. A diffuser forming a foam layer is installed in the lower part of the scrubber to increase the lime utilization coefficient. After the crystallization and separation of calcium sulfite and sulfate, the scrubbing liquid is recirculated within the scrubbing process. The SO₂ separation efficiency ranges from 80 to 90% at a gas flow

speed of about 2 m/sec and a spray zone height of between 5 and 10 m. The gas flow speed through the grid openings of the foam generator is between 15 and 20 m/sec. The hydraulic pressure loss of the scrubber is 100 mm of water column.

59523

APTIC NO. 84398

Krzysztofik, B. and J. Blonska

FILTRATION SET FOR REMOVING BACTERIA AND PHAGES FROM THE AIR. (*Zestaw filtracyjny do oczyszczania powietrza z bakterii i fagow*). *Air Conserv.* (English translation from Polish of: *Ochrona Powietrza*), 7(5):25-37, 1973. 12 refs.

NTIS: TT 73-54096/5

The use of filtration for removing microorganisms from the air is discussed. Air is cleaned of bacteria and phages by compound filters: first, by fiber ceramics possessing oligodynamic action, and sterilized by chemical or physical methods. This type of filter assures full sterility of the treated air. The filtration is highly efficient, and removes not only bacteria but actionophages. (Author abstract modified)

59524

APTIC NO. 81772

Kurian, P. C.

POLLUTION PROBLEM AT E.I.D-PARRY LIMITED FERTILISER FACTORY AT RANIPET. *Fertiliser News*, 18(9):17-18, Sept. 1973.

Stack emissions generated by a superphosphate and sulfuric acid plant associated with a fertilizer manufacturing operation are described along with methods for their control. The main effluent from the sulfuric acid plant is unconverted or unabsorbed sulfur dioxide which generally does not exceed 0.2%. A maximum conversion of SO₂ to sulfur trioxide is achieved when the plant is operated at a SO₂ input to the converter of 7-7.5%. Emissions are controlled by dispersion using a 30.5-meter high stack. Emissions from the superphosphate plant include silicon tetrafluoride, hydrogen fluoride, hydrogen chloride, and fluorine, with the latter compound being the main pollutant. These gases are controlled by absorption in a spray tower. The absorption efficiency of the scrubber ranges from 65-70%. Unabsorbed gas from the scrubber is discharged through a stack that is 21.3 m above ground level.

59525

APTIC NO. 83666

Lakmarker, G.

CATALYTIC FILTER MEDIUM DESTROYS ATMOSPHERIC POLLUTANTS. *Building Serv. Engr.*, vol. 41:30-31, May 1973.

The use of a catalytic filter medium in the control of air pollution is discussed. A new filter medium called Collo-Sanilan not only absorbs obnoxious and toxic gases, but also destroys them chemically before they have a chance to seep back into the atmosphere. The active substances are chiefly redox catalysts to promote the chemical reaction, and various adsorbents. As the foul air passes through the foam, the gases to be destroyed are first brought into contact with it and then absorbed by the highly dispersive synthetic foam system. Within this system the finely distributed catalysts bring about an effective oxidation of the bases to convert them into non-injurious products.

59526

APTIC NO. 81773

Latey, N. G.

POLLUTION IN PHOSPHATIC FERTILISER PLANT.

Fertiliser News, 18(7):29-30, July 1973.

Gaseous and particulate emissions generated by superphosphate and sulfuric acid plants associated with a phosphatic fertilizer manufacturing operation are reviewed along with methods for their control. Sulfuric acid plant emissions consist mainly of sulfur dioxide and sulfur trioxide. These pollutants, though uncontrolled, are generally maintained at 0.1-0.12% and 0.01-0.14%, respectively, of the stack

CONTROL METHODS

gas composition. Fluorine, hydrogen fluoride, and silicon tetrafluoride are the main gaseous emissions generated by the superphosphate plant. These emissions are controlled by a combination of spray scrubbing and wet cyclone treatment. Dust emissions arising from the superphosphate plant are controlled by bag filters.

59527

APTIC NO. 79244

Lindsay, R. and J. Wilson

HEAT PIPE VAPORISATION OF GASOLINE-VAPIPE.

Preprint, Environmental Protection Agency, Washington, D. C., Office of Air and Water Programs, 16p., Oct. 4, 1973. (Presented at the Low Pollution Power Systems Development and Alternative Automotive Power Systems Coordination Meeting, Ann Arbor, Mich., Oct. 14-19, 1973.)

The importance of air-fuel ratio and gasoline mixture homogeneity in terms of reducing automobile exhaust emissions and increasing fuel economy is discussed, and a device designed to vaporize gasoline and thus improve mixture quality is described. Operation of gasoline engines at air-fuel ratios in excess of 20:1 is demonstrated to result in carbon monoxide and nitrogen oxide emissions below the 1976 Federal requirements and without recourse to additional exhaust treatment devices. A heat tube device, known as the Vapipe, is designed to utilize engine exhaust heat for the vaporization of the gasoline fuel, thus achieving a better mixture quality. The device also allows for engine operation at very lean limits. Emissions tests with an automobile powered by a 110 cu in. engine operating on a lean air-fuel mixture and equipped with the Vapipe device reveal hydrocarbon, carbon monoxide, and nitrogen oxide emissions of 1.5, 3.7 and 4.6 g/mi, respectively, as compared to values of 2.2, 16.4, and 5.4 g/mi, respectively, for the same car without the Vapipe device (1975 Federal Test).

59528

APTIC NO. 81975

Marghita, D. I. and B. S. Gottesman

REDUCTION OF SULFUR LOSSES IN THE WET SCRUBBING OF GASES BY RAISING WASH WATER TEMPERATURE. (*Reducerea pierdilor de sulf la purificarea umeda a gazelor prin ridicarea temperaturii apei de spalare*). Text in Rumanian. Celul. Hirtie (Bucharest), 22(6):257-259, 1973. 1 ref.

Scrubbers of the Lurgi (sprayer) type and bubbler type are analyzed in terms of operating temperatures and the effect this has on air purification efficiency vis-a-vis operating conditions, especially as this relates to the yield of marketable sulfur products. A temperature of 114 C is calculated as the optimum washwater temperature (at the scrubber exit) but since this is above the water boiling point it is impractical for other technical reasons. However, if the exit temperature is raised from 45 C (a prevailing usage in pulp mills) to 90 C, then calculations show a cost savings of \$5.60/hr, or \$38,460 on an annual basis.

59529

APTIC NO. 84429

McClure, Roger N.

DISPOSAL OF SUBMERGED ARC FURNACE FUME.

American Inst. of Mining, Metallurgical, and Petroleum Engineers, Elect. Furn. Conf. Proc. 31st, Cincinnati, Ohio, 1973, p. 68-69. (Dec. 5-7.)

The methods of disposal of silica fume are described. Volatilized silica is collected from the exhaust gases of the furnaces in bag filters. It contains in excess of 95% amorphorous silica and 2% carbon. The fume emitted by these furnaces is composed primarily of amorphorous silicon dioxide. The discrete particle has a diameter averaging 100 millimicron. Principal methods of disposal include: dumping in a landfill area; discharge into prepared sludge ponds; sale to consumers; and recycle of the product as a raw material through the electric furnace.

59532

APTIC NO. 67088

59530

McConnell, R. J. and T. F. McDonnell

FUEL AND LUBRICANT EFFECTS ON OXIDIZING CATALYSTS. Preprint, Society of Automotive Engineers, Inc., New York, 7p., 1973. 8 refs. (Presented at the Society of Automotive Engineers, Automobile Engineering, Meeting, Detroit, Mich., May 14-18, 1973, Paper 730597.)

The loss of efficiency of oxidizing catalysts, which probably will be required in the future to meet vehicle emission control standards, was studied in engine dynamometer tests and in vehicles operated under customer service driving conditions. Zinc, barium, calcium, and magnesium additives in engine oils and the sulfur level in the fuel do not have an apparent effect on catalyst deterioration. Low levels of lead and phosphorus (0.05 g/gal Pb and 0.03 g/gal Pb plus 0.005 g/gal P) in fuel did have an apparent effect. Additives in SE engine oils A, B, and C did not give significant greater deterioration effects than the ashless oil. (Author abstract modified)

59531

APTIC NO. 84294

Medici, Mario

AUTOMOBILE AND BOAT ENGINES WITH REDUCED POLLUTANT EMISSION. (*Motori automobilistici e motonautici meno inquinanti*). Text in Italian. Atti Ist. Veneto Sci. Lett. Arti Cl. Sci. Mat. Natur., vol. 131:205-212, 1972-1973.

Guidelines for gasoline engine vehicle owners to reduce pollutant emissions include improved regulation and maintenance of carburetors, periodic check-ups, the use of appropriate fuel and lubricating oil, and the maintenance of anti-pollution devices on the cylinders. In the case of diesel motors, it is recommended that owners not modify the regulation of the oil injection pump; the entire injection system should be periodically checked. Research by IIEC on anti-pollution devices for automobiles aims at improving various emission packages; these comprise equipment for the recirculation of gas and fumes to the cylinders and one or more thermal reactors and catalytic converters. Other innovations include the replacement of fuel feeding through the carburetor by fuel injection in the cylinders, and the use of variable-distribution-during-operation system which changes the opening times of the distribution valves. For automobiles and small motor boats, the following technological improvements are presented: Stirling-Philips motor equipment which operates with hot air, hydrogen, or helium; steam-based motors; gas turbine motors; and mixed thermo-electric propulsion using cells with liquid fuel. For buses, trucks and large motor boats, dual fuel motors are recommended which work on liquefied natural gas.

59532

APTIC NO. 83456

Meerovskaya, V. I., N. U. Rizaev, R. Khiterer, and E. A. Kazahova

PROCESSING OF GASES FROM THE THERMAL FIXATION OF ATMOSPHERIC NITROGEN. (*Pererabotka gazov termicheskoy fiksatsii atmosferno azota*). Text in Russian. Dokl. Akad. Nauk. Uz. SSR, no. 9:32-34, 1973. 2 refs.

A method was developed for the adsorption concentration of nitrogen oxides with silica gel and for the purification of exhaust gases which are free of carbon dioxide. The experiments showed that sorbent moistening increased the adsorption effectiveness of nitrogen dioxide when CO₂ sorption was sharply inhibited. The moisture range (5% water) within which the process can be best realized was found. Test results on sorption dynamics of NO₂ with silica gel at about 5% of moisture and at t equals 0 and 20 C, and with space velocities of 4000 and 35,000/hr, were used to find the relationship between the relative saturation of silica gel and the main characteristics of the sorption process. To determine the enrichment of weak nitrous gases with silica gel when humidity was about 5%, and in cases of simultaneous adsorption of

NO₂ and CO₂, experiments were conducted at t equals 0 and 20 C with 50% CO₂ present. The sorption factor of CO₂ was established at B₂ equals 0.02. The experiment proved the efficiency of conducting NO₂ sorption with or without CO₂.

59533

APTIC NO. 79870

Mehqemeja, Sami and Mihal Prifti

REMOVAL OF HYDROGEN SULFIDE FROM INDUSTRIAL WASTE GASES. (Aftesite adsorbuese te mineralit te pishkashit kundrejt gazit sulfhidrik (H₂S)). Text in Albanian. *Bul. shkencave te natyres*, 27(3-4):35-41, 1973. 4 refs.

The poor quality iron ore obtained in Pishkashi can be used advantageously for the absorption of hydrogen sulfide from industrial waste gases. These sulfur-loaded ores are then used to manufacture sulfuric acid. The reaction is run at less than 40 deg. pH between 7 and 7.2, and water content greater than 50%. The absorption of H₂S at several temperatures and pressures is given. (Author abstract)

59534

APTIC NO. 79261

Orth, Karl-Heinz

HEAT-POWER STATIONS AND PROTECTION OF THE ENVIRONMENT. CLEANER AIR BY OPTIMAL COMBUSTION OF HEAVY FUEL OIL. (Heizkraftwerk und Umweltschutz. Reinere Luft durch optimale Verbrennung bei Schwerölbetrieb). Text in German. *Fernwaerme Int.*, 2(6):153-162, Dec. 1973. 16 refs.

The conditions of sulfur trioxide and nitrogen oxides formation in oil-fueled combustion equipment are discussed, and the environmental advantages of remote heating stations are outlined. Satisfactory combustion conditions can be achieved only in combustion equipment in which the combustion process is continuously controlled through the measurement of different parameters, such as the acid dew point, oil viscosity, combustion air intake, soot number, and solids content. Many of the commercially available oil burners permit satisfactory combustion at a minimal air-excess coefficient. If it is impossible to reduce the air-excess coefficient, the formation of SO₃ can be inhibited, and consequently the corrosion hazards can be reduced by the use of additives, such as dolomite, magnesia, silica, zinc oxide, or ammonia. The specific dust emission from oil burners can be reduced to 6 kg/ton of oil by the use of centrifugal dust separators. Remote heating stations, equipped with automatic monitoring instruments, help reduce the air pollution in cities.

59535

APTIC NO. 67131

Patel, Nitin R.

OPTIMAL CONTROL OF SULFUR DIOXIDE EMISSIONS AT POWER STATIONS: MODELS AND A CASE STUDY. *Massachusetts Inst. of Tech., Cambridge, Mass., Operations Research Center, Army Contract DAHCO4-73-CO032, Program Element P-9239-M, TR 82, MIT OSP 81219, ARO 9239.10, 126p., Sept. 1973. 45 refs.*

NTIS, DDC: AD 775392

Dynamic emission controls for power stations which depend upon meteorological conditions and selective fuel burning are analyzed and contrasted with fixed controls. A meteorological model is developed to relate source emissions with average pollutant concentration in a region under different meteorological conditions, and the problem of determining optimal dynamic controls for sulfur dioxide emissions at fossil-fueled power stations is treated by constructing a linear programming model. The model is extended to encompass seasonal control of sources which are not amenable to more frequent controls; another extension is constructed to analyze the effects of errors in meteorological forecasts. The various models are applied to the Metropolitan Boston Air Pollution Control District, and the results show substantial savings from dynamic as compared to static controls. The impact of dynamic emission controls on new site selection for fossil-fueled power stations

is examined, and a stochastic linear programming formulation is developed along with an algorithm for solving the linear programming problem. (Author abstract modified)

59536

APTIC NO. 81820

Pershing, D. W. and E. E. Berkau

THE CHEMISTRY OF NITROGEN OXIDES AND CONTROL THROUGH COMBUSTION MODIFICATIONS.

Advan. Chem. Ser., no. 127:218-240, 1973. 40 refs. (Presented at the American Chemical Society, Division of Fuel Chemistry and Division of Petroleum Chemistry, Meeting, 164th, New York, Aug. 29-30, 1972.)

The chemistry of nitrogen oxide formation during hydrocarbon combustion at atmospheric pressure is reviewed. During natural gas combustion, NO_x forms via a thermal fixation mechanism, whereas during heavy oil and coal combustion, NO_x is formed via the fixation mechanism and through the conversion of bound nitrogen in the fuel to nitric oxide. The fixation mechanism depends strongly on both the local gas temperature and the local stoichiometry. Thus, temperature reduction techniques such as flue gas recirculation and water injection and reductions in oxygen availability via low excess air firing or staging are effected in practical NO_x control. The conversion of fuel nitrogen appears to depend on the amount of nitrogen present in the fuel and the oxygen availability. (Author abstract modified)

59537

APTIC NO. 81825

Qader, S. A. and G. R. Hill

PRODUCTION OF LOW SULFUR FUEL OILS FROM UTAH COALS. *Advan. Chem. Ser.*, no. 127:91-97, 1973. 6 refs. (Presented at the American Chemical Society, Division of Fuel Chemistry and Division of Petroleum Chemistry, Meeting, 164th, New York, Aug. 29-30, 1972.)

Low sulfur fuel oils were prepared from a high volatile bituminous coal by high-temperature, high-pressure hydrogenation. The ratio of oil-to-gas yield was about three at a coal conversion of 80%, with 23% of the coal sulfur being contained in the oil. The oil sulfur content was constant for different coal conversion levels. Data obtained from a semi-continuous, dilute phase hydrogenation system indicated that whole oil can be directly used as a fuel oil where 1% sulfur is tolerated. Fuel oils containing 0.5 and 0.25% sulfur were produced by desulfurization of the whole oil. According to a preliminary economic evaluation, low sulfur fuel oils can be produced from coal by hydrogenation at a manufacturing cost of about \$5-6/barrel. (Author abstract modified)

59538

APTIC NO. 81845

Quader, Ather A.

EFFECTS OF SPARK LOCATION AND COMBUSTION DURATION ON NITRIC OXIDE AND HYDROCARBON EMISSIONS. *Preprint, Society of Automotive Engineers, New York, 11p., 1973. 17 refs.* (Presented at the Society of Automotive Engineers International Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1973, Paper 730153.)

The effect of spark plug location and combustion duration on nitric oxide and hydrocarbon emissions from a single-cylinder engine with a specially modified combustion chamber was studied. Nitric oxide emissions were the same with the spark plug located either near the intake or exhaust valve but were higher with the spark plug midway between the valves or with dual ignition. Hydrocarbon emissions were lowest with the spark plug located near the exhaust valve and increased with the distance of the spark plug from the exhaust valve. A decrease in NO emissions associated with charge dilution was isolated into a pure dilution effect and a combustion duration effect. The combustion duration effect was minimal at rich mixtures and increased with air-fuel ratio. (Author abstract modified)

59539

APTIC NO. 81915

Rains, Bernard A., Mario J. DePrimo, and I. L. Grosceclosé

ODORS EMITTED FROM RAW AND DIGESTED SEWAGE SLUDGE. Metropolitan St. Louis Sewer District, St. Louis, Mo., Environmental Protection Agency Grant WPRD 23-01-68, Proj. 1101 EZQ, Program Element 1BB033, ROAP 21-ASD, Rept. EPA-670/2-73-098, 76p., Dec. 1973. 23 refs.

Odors emitted during the thickening of raw and secondary sewage sludge were investigated along with methods for their control. A styrofoam dome covering a sludge thickener was used to control atmospheric conditions and concentrate the odors. Field collected vapor samples were analyzed using gas chromatography. Mercaptans and amines were the major odor causing compounds; other compounds which were minor contributors to odor were aldehydes, alcohols, and organic acids. Air dilution using cyclic operation of an exhaust fan proved to be an effective odor control method when outside atmospheric conditions were conducive to odor dissipation. Passing vapors through activated carbon filters (adsorption) was not completely effective in controlling odors since some residual odor was still detected. A 1.5-milligram/l solution of chlorine was effective in oxidizing and removing all odors from vapor samples bubbled through the solution. (Author abstract modified)

59540

APTIC NO. 79904

Raper, A. G., A. E. S. Pengelly, R. H. Siddons, A. Hamilius, G. E. Kimber, H. K. Jaworski, J. R. Ayres, E. Gunther, P. Joustra, R. Johnson, B. Nordstrom, G. Wright, C. W. Latty, B. R. Jones, C. L. Reid, W. K. Phillips, and D. G. Bowen

EXPERIENCE WITH WASTE GAS SYSTEMS: DISCUSSIONS 1 AND 2. In: *Operation of Large BOF's*, ISI Publ. 139, 1973. p. 26-55.

Problems with an industrial cooling system are discussed. Three systems of gas collection and cleaning, each utilizing the principle of suppressed combustion, are described. They differ in the method adopted to limit the amount of air entering the hood. Associated with this control is a different configuration of the lower part of the hood or skirt. The OG system at the British Steel Corporation (Port Talbot works) is described. The dust emitted from the stack is less than 0.04 g/N cu ft. Dust loading on entry to the disk scrubber is 37 g/cu ft at 850 C, and 0.4 g/cu ft at 71 C, when leaving the scrubber, while pumping at 1155 gal/min. The situation at the Normandy Park steel plant is also described. The main problem associated with this plant involves the waste heat boiler, in the form of very severe erosion of the boiler tubes. Secondary fume emission is discussed. Equipment should be designed to deal with peak loads rather than averages. Steep roofs are recommended for steel plants because of their draft characteristics. Fumes in a steel plant originate during the transferring of hot metal to the charging ladle, the charging of hot metal and scrap to the vessel, blowing, and tapping and ladling. Methods of dealing with each are discussed. The layout of the charging bay should allow better hood location, possibly involving radical changes in charging techniques.

59541

APTIC NO. 80274

Rothwell, F. and P. Swift

THE INTEGRATION OF FABRIC AIR FILTERS IN CHEMICAL PLANT -- SOME PROBLEMS WITH REACTIVE DUSTS. Preprint, Sheffield Univ., Sheffield (England), Dept. of Chemical Engineering and DCE Entstaubungsanlagen GmbH, Essen (West Germany), 23p., 1973. 14 refs.

The principles and practice of fabric filtration are discussed. A test is described that determines the maximum temperature to which the filter cake may be subjected without thermal degradation. The influence of abnormal thermal effects in the drying of organic solids is also considered. One is effectively returning material from room temperature to the ambient temperature and humidity of the transfer line/filter unit in a recy-

cle operation, under these conditions since these particles are essentially smaller than the original spray dried product, they may be expected to suffer an extended residence time within the filter unit itself, further enhancing the probability of wetting of the fibers in cases where a viscous phase may be formed. Where one has the possibility of recirculation of a particular component, or a recycle stream leading to an extended residence time distribution within any part of the production unit, then consideration should be given first to the physical and chemical processes involved in the exposure of a particular product under limiting conditions of operation.

59542

APTIC NO. 82846

Saito, Yasauo, Shigenori Komura, Hisaaki Ochi, Hayao Kamata, Kazuo Matsui, Katsutoshi Yada, and Hidehiko Otani

THE LATEST INFORMATION ON DUST COLLECTING TECHNIQUES. (*Shujin gijutsu no saikin no doko*). Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind. Tech. Rev.), 10(5):92-98, 1973.

The recent trend in dust collecting techniques is reviewed with emphasis on the concept of invisible pollutant emissions, expansion of air pollution control measures, and the role of dust collectors in air pollution control. The effects of various factors on the collecting performance of electrostatic precipitators were investigated. Relationships between dust resistivity and voltage-current, apparent operation voltage and resistivity, dust resistivity and gas temperature-moisture content, gas temperature and operation voltage, effect of electrode contamination and moisture content and voltage-current, and mixed-in low-resistivity material and resistivity are discussed. Examples of improvement in collecting performance relating to discharge characteristics are given. Relationships between dust grain size and collecting efficiency, gas velocity and collecting coefficient, and rapping cycle and collection efficiency are described. Basic studies on electrostatic precipitators are given with model test results, including relationships between electrodes and collecting efficiency, electrode spacing and collecting efficiency, and corona current and collecting efficiency.

59543

APTIC NO. 49302

Sano, Tsukasa and Tadashi Nakamura

METHOD FOR REMOVING SMALL AMOUNTS OF SULFUR IN GAS. (*Gasochu no biryo iwobun jokyohoho*). Text in Japanese. (Mitsubishi Gas Chemical Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 48-4314. 3p., Feb. 7, 1973. 2 refs. (Appl. Jan. 18, 1968, 1 claim).

A synthetic catalyst can be used to produce ammonia and methanol from fuel gases such as natural gas. The fuel gases must be desulfurized to avoid catalyst poisoning. A copper oxide and zinc oxide and/or chromium oxide desulfurization agent was used. Oxygen and steam are added to the gas to be desulfurized. The gas is preheated by a preheater to 150-200 C and led to a desulfurizer in which the temperature is raised to 250-450 C. The heat is used by a heat exchanger for preheating the gas. The desulfurization method is effective for gas containing up to 200 ppm of sulfur.

59544

APTIC NO. 83619

Schreter, Robert E.

HOW TO CUT CARBON MONOXIDE FROM AGGREGATE DRYERS. Roads Streets, 116(11):138-141, Nov. 1973.

The control of carbon monoxide emissions from asphalt batch plant dryers is discussed. Carbon monoxide is formed as a result of quenching in the burner flame. The amount of quenching is directly proportional to the quantity of chilled material falling through the flame and to the relative position in the flame that this material falls through. The CO formation is eliminated by providing premixing air in proportion to the fuel firing rate. This modifies the reactivity of the flame and the flame shape. The forward fighting in the dryer is

modified to change the quantity and proximity of material falling through the flame.

59545

APTIC NO. 84399

Soltys, A.

THYRISTORS IN SUPPLY ASSEMBLIES FOR ELECTROFILTERS. (Tyristory w zespołach zasilających do elektrofiltrów). *Air Conserv.* (English translation from Polish of: *Ochrona Powietrza*), 7(6):1-7, 1973. 5 refs.

NTIS: TT 73-54096/6

The use of thyristors for constructional and technological solutions on supply assemblies for electrofilters is discussed. Thyristors are most efficient in the final control unit of the feeding regulation assembly. Use is especially advantageous with a semiconductor voltage regulator. Final effects of their use consist of modernization of the supply unit, modernization of technology, and lowered costs of production linked with considerable improvement of exploitation properties. (Author conclusions modified)

59546

APTIC NO. 83447

Spektor, A. N., A. D. Markov, and L. S. Grabko

ABSORPTION OF SULFUR DIOXIDE BY COMPONENTS OF THE MIX BY FLUXED PELLETS. (Pogłoshchenie sernistogo gaza komponentami shikhty oflyusovannykh okatyshy). Text in Russian. *Izv. Vysshikh. Uchebn. Zavedei Chernaya Met.*, no. 11:29-32, 1973. 6 refs.

The adsorption of sulfur dioxide from flue gases with sulfate formation by limestone, calcia and roasted open-hearth furnace iron ore was studied in laboratory tests. The rate of SO₂ adsorption from a flue gas with 85% SO₂ was independent of the particle size of limestone in a grain size range of 0.14-3 mm at 800 C. The higher adsorption rate was 16%. The sulfate sulfur content of calcia increased with increasing temperature, while the content of adsorbed sulfur in calcia was independent of the temperature, but it increased with temperature in limestone. The total sulfur and sulfate sulfur content of iron ore increased negligibly at 800 C in 5 minutes. Both the total and sulfate sulfur contents in the oxidized iron ore decreased when the flue gas SO₂ content was increased from 33.3% to 83.3%.

59547

APTIC NO. 50283

Stahman, Ralph C. and John P. DeKany

THE DIESEL EMISSION PROGRAM OF THE ENVIRONMENTAL PROTECTION AGENCY. Preprint, American Petroleum Inst., New York, 19p., 1973. 10 refs. (Presented at the Farms and Construction Equipment Fuels and Lubricants Forum, Chicago, Ill., Feb. 1973.)

The research initiated by the EPA into diesel emissions and their control is reviewed. The various programs include the study of emission composition; the development of analytical methods for heavy hydrocarbons; determination of the odor-causing constituents in diesel exhaust; analysis of diesel smoke; studies on engine types and the effect on their operation and emissions of fuel additives, catalytic devices, fuel injection, and noise suppressors; durability tests; nitrogen oxides control through injection timing, exhaust gas recirculation, and air-fuel ratio modifications; and the development of emission and operating standards.

59548

APTIC NO. 82819

Suzuki, Saburo, Losuke Ueda, Yukio Sakae, and Masaaki Negoro

RECOVERY OF VALUABLES FROM OIL BURNING ASH. (Juyu nenshobai no shori to yukabutsu no kaishu). Text in Japanese. *Mitsubishi Juko Giho* (Mitsubishi Heavy Ind. Tech. Rev.), 10(5):211-218, 1973. 3 refs.

Treatment and material recovery methods for oil burning ashes collected by electrostatic precipitators during the removal of

particulates from flue gas of oil-fired boilers were developed after many years of pilot plant tests. The wet treatment methods developed are a crystallized separation method, in which nickel and vanadium are crystallized and separated, and a flocculated sedimentation method, in which materials are recovered as hydroxides. The dry treatment methods include a burning method, in which the burning ashes collected are combusted once again and materials are recovered as oxides. Descriptions of the crystallized separation method, consisting of an ash dissolving process, carbon separation process, Ni double salt separation process, vanadium pentoxide separation process and ammonia recovery process; the flocculated sedimentation method, consisting of an ash dissolving process, C separation process, vanadium hydroxide separation process, nickel hydroxide separation process and NH₃ recovery process; and the burning treatment method are given, with flow sheets. The initial equipment cost, running cost, and economy of material recovery are evaluated. The chemical compositions of recovered cakes are also given.

59549

APTIC NO. 84423

Szarawara, J., J. Marszalek, and C. Kozik

A NEW COMBINED ZINC METHOD OF UTILIZING SULFUR DIOXIDE EMITTED IN METALLURGICAL WASTE GASES. (Nowa cynkowa kombinowana metoda utylizacji dwutlenku siarki z hutniczych gazów odlotowych). *Air Conserv.* (English translation from Polish of: *Ochrona Powietrza*), 7(6):32-45, 1973. 9 refs.

NTIS: TT 73-54096/6

A new combined zinc method of utilizing sulfur dioxide emitted in metallurgical waste gases is described. Waste metallurgical gases are absorbed at temperatures of 20-80 C by a suspension of technical zinc oxide, derived directly from roasters, in a solution of zinc sulfate having a concentration of 0.1 to 0.25 mole/l. The zinc sulfite obtained in this process is used in a moist state as an addition to the sulfur charge on the first Dwight-Lloyd belt. The SO₂ liberated during decomposition is carried off with concentrated gases for further processing into sulfuric acid. The absorbing solution is partially carried off, and after purification and eventual thickening used for obtaining metallic Zn by means of electrolysis. (Author conclusions modified)

59550

APTIC NO. 67121

Thielke, John Ferdinand

AN APPROACH FOR OPTIMIZING LONG RANGE AIR POLLUTION CONTROL STRATEGIES FOR MAJOR POINT SOURCES IN A GROWING URBAN INDUSTRIAL AREA. Washington Univ., Seattle, Dept. of Civil Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1973, 283p. 31 refs.

An approach for determining optimal air pollution control strategies for major point source emission sources of suspended particulate matter in a geographically small but growing urban industrial region is provided in which a set of strategies which achieves and maintains concentrations below the standard at the least total control cost over time is defined and selected. Dynamic programming, an optimization technique, provides the basis for identifying an optimal sequence of control levels over time for each source. Computer simulation of the air pollution process as a dynamic system includes the coupling together of an air quality dispersion model, and atmospheric emission model, and an industrial employment growth and allocation model along with a control model in addition to the optimization procedures. The approach appears capable of examining the impact of potential urban industrial growth in terms of control costs necessary to achieve given air quality standards.

59551

APTIC NO. 83625

Wackenhuth, Erwin C., L. W. Lamb, and J. P. Engle

USE AND DISPOSAL OF BOILER CLEANING SOLVENT. *Power Eng.*, 77(11):68-71, Nov. 1973.

Data on the use of an ammonium citrate base boiler cleaning solvent are presented. The data were taken during burn operations of a boiler producing 540,000 lb of steam/hr at a pressure of 1350 psi. Tests were made while burning ammoniated citric acid and while burning water flush. The amount of nitrogen oxides released during normal operation was 353 ppm for the ammoniated citric burn and 341 ppm for the water flush burn; NOx released during the burning period was 86 ppm and 196 ppm; a decrease in NOx was 287 ppm and 145 ppm; a decrease in NOx due to burn was 815 and 435; sulfur dioxide released during normal operation was 94 ppm and 124 ppm; SO2 released during burn period is 3 ppm and 90 ppm; decrease in SO2 is 91 ppm and 34 ppm; and a decrease in SO2 due to burn is 97% and 27%.

59552

APTIC NO. 67091

Woods, R. L.

A FLUIDIC FUEL-INJECTION SYSTEM UTILIZING AIR MODULATION. Preprint, American Society of Mechanical Engineers, New York, 9p., 1974. 44 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Detroit, Mich., Nov. 11-15, 1973, Paper 73-WA/Fics-3.)

A unique approach to fuel management systems applicable to spark ignition engines is discussed. In this air-modulation system, the operator controls the fuel consumption directly, as well as the control circuit schedules and the air consumption. This approach is opposite to existing systems and provides many desirable inherent features that have to be built as auxiliary circuits on conventional systems. This approach to fuel management could help reduce emissions, increase drivability, and is very well suited for fluidic control. The bench test results of a prototype system are presented. A review of previous fluidic fuel management projects is also given, including carburetor enhancement devices, continuous-fuel injection systems, and pulsed fuel-injection systems. (Author abstract modified)

59553

APTIC NO. 81963

Yue, Brown K.

NITRIC OXIDE CONTROL IN MHD TOPPING CYCLES.

Cornell Univ., Ithaca, N. Y., Cornell Energy Project, National Science Foundation Grant, Paper 73-7, 92p., Nov. 1973. 23 refs.

Two-stage combustion is analyzed as a method for controlling nitric oxide emissions from a magnetohydrodynamic generator burning natural gas. A simplified model of the system which treats the different components separately is developed. It is also applied to burning at stoichiometry, and results are compared. The combustor, the nozzle, the diffuser, the heat exchangers, and the second stage combustor are discussed. The kinetic schemes for methane-air combustion and NO formation are discussed. Both NO formation and carbon monoxide oxidation are significant in second stage combustion. Two stage combustion, if applied properly, yields a lower NO concentration in the emission products than a single stage process. The major reduction in NO occurs after the combustion products leave the diffuser and before the temperature drops to below 1800 K in the heat exchanger. The mean flow residence time from the exit of the diffuser to the inlet of the second stage combustor at the temperature of 1282 K is 2.5 sec or longer. The inlet temperature of second stage combustion is also a determining factor in NO emissions control. The lower of the two cases studied, 1282 K and 1582 K, is more effective in limiting NO formation. The NO concentration is much lower at the end of the combustion than its value at equilibrium. Two stage combustion is not only an effective method for reducing NO emission but also effective in limiting carbon monoxide production due to fuel rich burning in the initial stage. (Author abstract modified)

59554

APTIC NO. 80213

Organisation for Economic Co-operation and Development, Paris (France), Environment Directorate

AIR POLLUTION BY FLUORINE COMPOUNDS FROM PRIMARY ALUMINIUM SMELTING. 44p., 1973. 18 refs.

Emission of fluorine compounds is the major air pollution problem of the primary aluminum smelting industry. Typical data regarding quantity and composition of fluorine air pollutants released in the various processes using different types of electrolysis pots are given. Some pots are designed with a hood which allows a considerable fraction of the release to be collected in a relatively concentrated form. Typical data regarding collection efficiencies are exhaust and ventilation requirements for pot rooms are given. Electrostatic precipitators, scrubbers, and bag filters are used for cleaning pot exhaust. Adsorption of hydrogen fluoride on alumina to recover fluorine compounds is used increasingly. The most efficient gas cleaning systems operate at above 90% efficiency. Total emissions obtainable with combination of pots and gas cleaning equipment are calculated. The investment in medium or highly efficient gas cleaning systems ranges from 5% to 10% of the investment in the electrolysis plant. According to data received from 12 countries representing 71% of the aluminum production in the Organisation for Economic Co-operation and Development area, 23% of the production takes place in plants having highly efficient gas cleaning. About 8% is produced in plants having no gas cleaning. (Author abstract modified)

59555

APTIC NO. 84349

AIR FILTRATION. CONFERENCE HELD 11/13/72 (PART I). (*Filtration de l'Air. Conference du 13 novembre 1972 (1ere partie).*) Text in French. *Chauff. Vent. Cond.*, no. 7:13-22, Oct. 1973.

Filtration mechanisms and methods are reviewed. Due to the imprecision of terminology, basic terms are defined with the support of AFNOR. The present terminology does not make distinctions among particles suspended in a gas; however, their behavior in calm air is essentially a function of their size and determines the method of liquid separation. In order to classify particles, variations in the fall of these particles in gas must be studied. To determine the separation mechanism, the behavior of a group of particles in a moving fluid has to be studied as the particles pass through a filtering medium. Each particle is subject to two forces: one resulting from gravity and the other from the pull of the fluid. Retention effects (adherence of a particle to a fiber) should be taken into consideration.

1972

59556

APTIC NO. 49997

Adachi, Noriyoshi, Toshimichi Tohyama, and Kiyotaka Hashimoto

COLLECTING CHARACTERISTICS OF THE MINI-CYLINDRICAL ELECTROSTATIC DUST COLLECTOR. (*Mini entogata denki shujinki no shujin tokusei.*) Text in Japanese. Japan Society of Air Pollution, Proc. Symp. Japan Soc. Air Pollut., 13th, 1972, p. 141. (Nov. 7-9, Paper 96.)

Basis dust collection characteristics were examined in this experiment using a specially designed mini-cylindrical electrical dust collector. The collector, capable of generating ion wind as a flow of gas, was composed of a steel pipe cylinder with the diameter of inner wall ranging from 16 to 30 mm, the thickness of inner wall 3 mm, and the length from 10 to 50 mm; a copper needle with the diameter measuring 6.1 mm; a sensor unit; and a thermistor anemometer. The collector, having a smoke generating substance placed between the needle and the cylinder, was incorporated in a container of 0.32 cu m. Initial density of the smoke was 60 mg/cu m and a positive, high

voltage was used. The gradually decreasing density was measured every 4 minutes. The smoke density was not decreased substantially when no exterior force was applied, but when a certain voltage was provided, the density dropped linearly during the initial period of voltage application. The lower the density became the lower the drop rate of the density. The passage of time required for duct collection to the level of 99% was proportionate to the increase of voltage, irrespective of the diameter. The time span became shorter as the diameter grew larger; time was shortest when voltage was equal to 10 kV. Time and dust collection efficiency 10 minutes after the experiment started were considered preferable when the length was shorter. In practical applications, however, it was assumed that the deterioration of time and efficiency would be offset by using a longer cylinder which had an extended area of dust collection. The optimum dust collection characteristics were obtained by increasing the impressed voltage, widening the inner wall diameter, and making the length of the cylinder shorter. Thus, the air in a room as wide as 20 cu m would be cleaned in about 4 hours when a cylinder with a 36 mm diameter is used.

59557

APTIC NO. 50260

Austin, Thomas C.

AN EVALUATION OF THE ECHLIN RETRO-FIT EMISSION CONTROL SYSTEM. Office of Air Programs, Test and Evaluation Branch, Rept. 73-7, APTD-1382, 6p., Oct. 1972.

The exhaust emission characteristics of a retro-fit emission control system were studied to determine the effect of the system on driveability, fuel economy, and emission levels of hydrocarbons, carbon monoxide, and nitrogen oxides. The system consisted of an ultrasonic generator, a carburetor spacer plate, and spark timing. The system had no adverse effect on either driveability or fuel economy. The Echlin system significantly reduced NOx emissions while increasing CO emissions. The emission reduction, however, was due to vacuum spark advance disconnect; the hardware itself, therefore, had no significant effect on exhaust emissions.

59558

APTIC NO. 41380

Baryshev, V. I. and M. A. Stolov

DETERMINING THE COMBUSTIBLE RESIDUES IN FLUE GAS AND THE YIELDS OF THE ASH TRAPPING FACILITIES FROM THE PULP COMPOSITION. (Ob opredelenii soderzhaniya goryuchikh v unose i koefitsienta poleznogo deystviya zolouloviteley po pul pe). Text in Russian. Elektr. St. (Moscow), no. 5:34-36, 1972. 5 refs.

Flue gas and ash separator pulp samples were analyzed for combustible contents to evaluate the efficiency of ash trapping devices. The combustible contents determined in flue gas and ash pulp samples were lower than those obtained from incineration loss, and the difference increased with increased alkali metal content in the ashes. The difference was due to the volatilization of hydrates, crystalline hydrates, and carbonates during incineration. The hydrate water contents in pulp were higher and the carbonate, carbon dioxide, calcium oxide, and magnesium contents were lower than in the flue gas, due to the dissolution of alkali metal compounds in the spray water of the wet-type ash trapping equipment. High-to-medium concentrations of alkali metal compounds, not bound in minerals, resulted in decreased amounts of trapped ash and reduced the yield of the ash trapping facility to the dissolution of inorganic parts.

59559

APTIC NO. 42159

Baudelaire, M.

PROGRESS ACHIEVED IN THE CEMENT INDUSTRY. (Progres realise dans l'industrie du ciment). Text in French. Pollut. Atmos. (Paris), 14(54):181-183, April-June 1972.

AIR POLLUTION ABSTRACTS, JUNE 1976

Progress achieved in the cement industry in the air pollution control area is reviewed. The production volume of the French cement industry now lies at 30 million tons/yr, which will expectedly rise to 40 million tons by 1980. Though the pollutants emitted by cement works are not noxious, and silicosis has not yet been observed among workers, pollution control is necessary to protect nearby residential areas. Decreasing emissions and providing favorable dispersion conditions are the basic means of pollution abatement, as applied in the cement industry. Continuous emission measurements are carried out, and research has been intensified to meet recent specifications imposed by the government. The specific dust emissions which accounted for about 0.5% of the production volume five years ago should be reduced to 0.1%. The maximum allowable dust concentration in waste gases from new facilities is 150 mg/N cu m, and a maximum of 1 g/N cu m is tolerated over limited periods in exceptional cases. The furnace stack heights are designed for the latter higher value.

59560

APTIC NO. 46832

Bryan, William P.

INLAND S TENNESSEE MILL WAS FIRST DESIGNED FOR AMMONIA BASE NSSC. Paper Trade J., 156(40):36-40, Sept. 25, 1972.

Inland Container Corporation's new 450 ton/day corrugating medium mill near Johnsonville, Tennessee, first in the United States designed specifically for the utilization of the ammonia base NSSC cooking process, started up in late 1970. The decision to use the ammonia base process was because of the ease of waste pulping liquor disposal by incineration. Wood preparation, the digester system, pulp washing, liquor making, multiple effect evaporators, the mill water supply are discussed. Pollution control features include the pulping waste liquor evaporation and burning system; primary and secondary treatment for all process water, storm drainage, and sanitary sewerage; a cooling tower to prevent thermal pollution of the lake, and an over-size save-all for maximum recovery of fiber in the paper machine system. Maintenance is also discussed.

59561

APTIC NO. 41317

Darby, K. and K. R. Parker

THE ELECTROSTATIC PRECIPITATOR AND ITS RANGE OF APPLICATION. Filtration Separation (Purley), 9(3):299-307, May/June 1972. (Presented at the Filtration Society's Conference on Filtration in Process Plant Design and Development, London, England, Sept. 28-30, 1971.)

The precipitation process may be applied to any type of suspended solid or liquid in almost all gases over a wide temperature-pressure field. In general the limitations are economic, based on the efficiency of removal. Otherwise, the only material limitation is the refractory nature of the process. The single-stage precipitator is the most commonly used type. The corona emitting electrodes both charge the particles and induce their drift toward the receiving electrodes. Plate type, single stage precipitators consist of charge parallel plates 8 to 12 in apart with corona electrode wires arranged perpendicular to the gas flow along the centerline between plates. In a single commercial installation, a million square ft of plate electrode and hundreds of miles of receiving electrode may be needed. The performance cannot be calculated accurately because the particle behavior depends on electrical properties determined by the gas temperature and moisture content. Estimates using the Deutsch law indicate that the size of the installation must be doubled to improve the efficiency from 90 to 99% and doubled again to improve from 99 to 99.99%. Some dry precipitators have been capable of removing particles as small as 0.01 micron with resistivity of 10 to the 12th ohms. Mist precipitators can be used to control particles of greater resistivity. Module construction allows economic control from 5000 cu ft/min to 50,000 cu ft/min in prefabricated units. Above 50,000 cu ft/min economy demands custom design.

59562

APTIC NO. 44138

Deitz, V. R. and J. L. Bitner

THE REACTION OF OZONE WITH ADSORBENT CHARCOAL. *Carbon*, 10(2):145-154, April 1972. 15 refs.

The progressive reaction of ozone and oxygen mixtures with charcoal at 26 C was studied to specified weight gains and to different subsequent weight losses when outgassed at various temperatures. Although each ozone-treated adsorbent gave evidence of continuous decomposition when introduced into a vacuum adsorption device, stability was obtained when the sample was cooled to 77.4 K. Degassing is associated with an inherent instability of the ozone product formed, and not to desorbed gases. The products were characterized by very large decreases in the nitrogen adsorption at 77.4 K. Two explanations are examined to account for the adsorption behavior. First, the etching reactions that prevailed during the formation of the original carbon adsorbent can continue and lead to pore structures of greater diameters and, accordingly less specific surface area, than the original charcoal. Second, a blockage of the micropore openings to nitrogen molecules can take place due to the chemisorption of oxygen at the critical openings of the porous carbon structure. A sequence of three reactions is suggested to explain both the weight changes upon ozone treatment and the unique behavior of the nitrogen adsorption isotherms determined at 77.4 K. (Author abstract modified)

59563

APTIC NO. 81843

Denton, George H., R. E. Hassel, and B. E. Scott

MINIMIZING IN-TRANSIT WINDAGE LOSSES. *AMC J.*, 1972:49-53, Sept. 1972.

Latex-water spray applications were field tested for their ability to reduce wind losses of pulverized low volatile coal transported in rail cars. The best applications which resulted in a crust of 1.5-2 in. were obtained with a combination of penetrating sprays and a fine mist spray. The most satisfactory ratio of latex to water was 1 gal of latex concentrate to 24 gal of water. Increases of 600 lb of dry coal/car were observed for rail cars carrying coal which was treated with the above binding mixture.

59564

APTIC NO. 83929

Eickelpasch, Dieter, Helmut Kahnwald, and Herbert Tichy

EFFECT OF THE OPERATION PRACTICE ON THE EMISSION OF POLLUTING AGENTS AND CONCLUSIONS FOR THEIR REDUCTION. (*Der Einfluss des Prozessgeschehens auf Emissionen und Folgerungen zu deren Verminderung*). Text in German. *Stahl Eisen* (Duesseldorf), 92(12):575-581, June 8, 1972.

In order to solve many emission problems it is necessary to look at processing operations in their entirety, starting with the casehardening material and its admixtures, their treatment, and waste disposal techniques. Gaseous fluoride compounds released during sintering can be converted to harmless calcium fluoride by reacting with calcium oxide, which is added for reduction. For the Linz-Donawitz process, converters and electric arc furnaces, it has been demonstrated that aerosol yield depends on the rate of decarbonization, for which there is a linear correlation with the oxygen surcharge of molten metals. Through the use of a 250 t LD converter, dust separation is improved if a half-size boiler with low-pressure combustion is chosen in place of operations in excess-air range with a full-size boiler. With respect to nitrogen oxide emissions, the quantity of fuel-bound nitrogen and the rate of heating and cooling flue gases affect the absolute temperature maximum and excess air in combustion. For lessening nitrogen oxide emissions, suggestions are given on excess air reduction, reflux of flue gas, injection of water or steam and a two-step combustion method as well as structural modification of burners and plants. Some discussions on possible conflicts with specific goals are presented.

59565

APTIC NO. 41326

Esaki, Naomi and Nobuo Inagaki

REMOVAL OF SO₂ AND H₂S GASES BY ACTIVATED CARBON. (*Kasseitanso ni yoru SO₂ gasu oyobi H₂S gasu no jokyo*). Text in Japanese. *Kuki Chowa Eisei Kogaku* (J. Japan Soc. Heating, Air Conditioning Sanitary Engrs. of Japan), 46(4):325-333, April 1972. 10 refs.

In order to find the adequate conditions of activated carbon for air clean up, the effect of thickness of activated carbon, sticking of dust, concentration of gases, and the effect of moisture and wind velocity on the clean up rate were tested. An activated carbon filter was applied for hydrogen sulfide removal. For sulfur dioxide removal, a section of activated carbon filter was used. The mechanism and speed of reaction of H₂S and SO₂ gases based on the experiment are discussed. Water which condensed in pores on the surface of activated carbon caused the reaction of SO₂. On the other hand, the reaction of H₂S gas was caused by chemical absorption.

59566

APTIC NO. 41388

Estes, E. M.

ALTERNATIVE POWERPLANTS FOR AUTOMOTIVE PURPOSES. *Proc. Inst. Mech. (Engrs. (London))*, 186(11):125-140, 1972. (Presented at the Institution of Mechanical Engineers Meeting, London, England, March 13, 1972.)

The spark ignition gasoline engine is the most feasible power plant available; an improved spark-ignition engine will be the powerplant of the future. Alternate powerplants, ranked in the order of highest feasibility, are the diesel engine, gas turbine, battery and fuel cell, hybrid combination of electrical-fuel power, the Stirling engine, and the Rankine steam engine. All designs have serious economic shortcomings. Diesel and turbine are expected to be able to meet the 1975 emission control deadlines but their use will be limited to the heavy transportation market. Battery and fuel cell designs are limited by weight and storage abilities. Hybrid designs do not reduce emissions significantly. The Stirling and Rankine engines have low efficiencies. The passenger car diesel would probably be twice as expensive as a spark ignition gasoline engine; the turbine, two to three times as expensive; the Stirling, about three; the steam engine, in the range of three to five times and the electric, with present technology, about six times.

59567

APTIC NO. 76270

Frankowiak, Sigismund, Pierre Bonnifay, Robert Dutriau, and Andre Deschamps

PARTIAL AND TOTAL SULFUR RECOVERY USING IFP PROCESSES IN OIL REFINERIES. Preprint, Institut Francais du Petrole, Rueil-Malmaison (France) and New York, 17p., 1972.

Three plans are presented for reducing sulfur emissions from a refinery, each based on the fundamental IFP liquid phase catalytic process by which hydrogen sulfide and sulfur dioxide react forming liquid sulfur. The plans are: reducing Claus tail gas to 2000 ppm SO₂, finishing Claus tail gas to approximately 100 ppm SO₂, and converting all wastes containing sulfur to salable sulfur eliminating both water and air pollution problems. Tail gas finishing involves incineration and scrubbing as well as IFP sulfur recovery. The economics of the plans are also discussed. (Author abstract modified)

59568

APTIC NO. 84468

Geraskina, L. G., K. B. Chernysheva, and Y. Y. Nikitin

EFFECT OF TEMPERATURE REGIME ON THE REMOVAL OF SULFUR COMPOUNDS. *Tr. Tekh. Ekon. Khim. Proizvoastva*, no. 89:10-13, 1972. Translated from Russian. *Leo Kanner Assoc.*, Redwood City, Calif., 7p., May 16, 1974.

The effect of temperature on the adsorptive scrubbing of thermal cracking gasoline was studied. A column type metal ad-

sorber was used at 20, 40, 60, and 80 C. The product was collected in three fractions. Each underwent distillation, after which its sulfur content was determined. Artificial mixtures were also studied. A temperature rise had a positive effect on the adsorption of thiophene with the alumina silicate catalysts. Polymerization products also gradually accumulated in the purified fractions. Adding 20% benzene to the mixture adversely affected the adsorption of thiophene. A rise in adsorption temperature intensified the polymerization of unsaturated hydrocarbons at the surfaces of the aluminosilicate catalyst. Experiments on adsorptive scrubbing of thermal cracking gasoline from the Angara petrochemical combine were conducted for the 55 to 125 C fraction under identical conditions. The total losses of unsaturated hydrocarbons in the aluminosilicate catalyst increased with temperature rise. Scrubbing the stock free of dienic hydrocarbons was only weakly dependent on adsorption temperature. Increase in polymer content depended directly on a rise in the adsorption temperature. Adsorptive scrubbing of thermal cracking gasolines must be conducted under optimal temperature conditions. Beyond temperatures of the order of 20 to 30 C, polymerization of unsaturated hydrocarbons at the surfaces of the aluminosilicate catalyst was intensified, the sulfur load of the adsorbent decreased, and the gasoline could not be used for purposes of synthesis directly after adsorptive scrubbing, owing to the presence of dissolved polymers in the stock.

59569

APTIC NO. 42026

Hashimoto, Eigo

INDUSTRIAL DRYING BY URBAN GAS. (Toshi gasu ni yoru kogyo knaso ni tsuite). Text in Japanese. *Nenryo Oyobi Nensho (Fuel and Combustion)*, 39(7):655-660, July 1972.

The prevention of offensive odor due to the discharge of solvents from drying apparatus was discussed. Methods for deodorization at combustion of combustible components, adsorption by activated carbon or silica, washing with water or chemicals, masking with aromatic substances, adsorption with ion exchange resin, or removal with a dust collector. The energy requirement for a combustion deodorization device is sometimes as much as twice that for a drying apparatus. An example of a drying device from a tin plate printing firm was used for the calculation of heat balance with or without a deodorizing apparatus. The drying apparatus had a treatment capacity of 2700 sq m/hr, gas exhaust of 52 cu m/min, solvent evaporation of 16 kg/hr, and solvent heat evolution of 10,000 kcal/kg. The heat required for the drying apparatus was found 249,300 kcal/hr and that for odorous gas combustion was 372,000 kcal/hr, approximately 1.5 times that of the former. The cost for deodorization could be minimized by using the heat of the hot exhaust gas.

59570

APTIC NO. 48983

Hauck, Jack E.

AUTOMOBILE REQUIREMENTS MEET HEAD ON WITH MATERIALS CAPABILITIES. *Mater. Eng.*, 76(3):52-63, Sept. 1972.

The Federal Clean Air Act established automobile exhaust emission standards for hydrocarbons, carbon monoxide, and nitrogen oxides which will require the use of high temperature combustion chambers to meet the standards. Devices such as thermal reactors will function at up to 2400 F. Engine compartment temperatures will be about 300 F. Therefore, new materials such as ferritic steels and ceramics will be required to withstand the high temperatures. Catalytic converters are also being developed which require lead-free fuels. A cheap catalyst is needed to replace platinum in catalytic converters. Since catalytic converters could cause unusually high temperatures under the hood, heat shields should be developed. Rotary combustion engines (Wankel), turbine engines, Rankine steam engines, stratified charge engines, and electric engines are being developed to replace the spark-ignition gasoline engine. However, no radically different power plant can reach

production before 1980. New vehicle safety standards have caused the development of new types of bumpers, air bags, seat belts, high strength steel frames, reinforced doors, crushable body panels, safety glass, and padded interiors.

59571

APTIC NO. 73369

Hayashi, Hiroshi, Nobuhiko Nakano, and Fumiko Sakai

STUDIES ON PERFORMANCE TESTING METHODS FOR EXHAUST EMISSION CONTROL CATALYTIC REACTOR. (Haiki joka shokubai riakuta seino shikenho no kenkyu). Text in Japanese. *Nihon Jidosha Kenkyusho Hojo Jigyo Hokokusho (Japan Auto. Res. Inst., Inc., Rept.)*, vol. 1972:66-88, March 1972.

The effect of an increase in aromatic hydrocarbon content in gasoline on catalytic reactors was studied by performing experiments on catalyst activity alone, and on HC purification by catalytic reactors. Comparisons were made between aromatic hydrocarbons (benzene, toluene, xylene), and paraffins (methane, propane) and olefins (ethylene, acetylene). Commercially available catalysts used in this study were 0.2% palladium or copper chromite systems on alumina carrier. The HC purification capacity of catalytic reactors was not impaired by decreases in saturated hydrocarbons or increases in aromatic compounds made in order to increase gasoline octane number. Results here do not agree with the 1960 data of K. Stein, et al, but do agree with more recent data of L. S. Caretto, et al (1966), and E. E. Weaver (1969). When hydrocarbons were passed through catalytic reactors erratic results were obtained, which did not necessarily agree with the experimental results obtained with catalysts alone. Paraffins were found to be not necessarily less reactive than aromatics. Among aromatic compounds, reactivity fell as more ethyl groups were present. Hydrocarbon concentration distribution in exhaust followed the same distribution pattern as in the original gasoline, even when concentrations were reduced to 1/4 by passage through the catalytic reactor. Catalytic reduction of nitrogen oxides by carbon monoxide was also investigated. Catalysts used were 0.5% platinum (pellet on active alumina), copper chromite (extrusion and pellet), Monel Metal (nickel 70% and copper 30% molded into pumice shape). On Pt catalyst, as CO concentration decreases, nitric oxide conversion increases. However, for some copper chromite catalysts NO conversion increases with an increase in CO concentration. Optimum ratios of CO/NO concentrations can vary with the catalyst. Formation of nitrous oxide should be investigated, although when NO concentration is high, and CO concentration is low, automotive exhaust temperatures are supposedly too high for N2O formation.

59572

APTIC NO. 41318

Hill, D. G.

NEW CONCEPTS IN AIR FILTRATION. *Filtration Separation (Purley)*, 9(3):318-328, May/June 1972. (Presented at the Filtration Society's Conference on Filtration in Process Plant Design and Development, London, England, Sept. 28-30, 1971.)

Electronic particle counters and fluorescent aerosols permit air filter efficiencies to be measured from 0.3 micron upward with much greater efficiency than in the past. This is important in that fines must be removed in many processes in order to prevent their accidental agglomeration into larger size particles in the post-filtration airstream. One electronic particle counter uses a photomultiplier in conjunction with a pulse height analyzer to measure sixteen size ranges between 0.32 and 8 micron. Filter penetration is measured by fluorometry. Photocell measurements are made of a dissolved dye of known size distribution collected on post-filter targets. The size range covers 1 to 10 micron with efficiencies to five decimal places. Though 1% by weight of the particulate matter in air averages 0.25 micron, it constitutes 91.5% of the particle count; it is this size fraction that causes the most irritation to humans and hazard to life. In those instances where filters have given unsatisfactory results, it has usually been due to incorrect filter

CONTROL METHODS

59577

selection. The capital costs of air filtration increase with the degree of cleanliness required, but the return on investment is frequently more attractive in the high efficiency range.

59573

APTIC NO. 40815

Iwao, Norito, Koichiro Naito, Tadashi Kawaguchi, Monoru Maeda, and Toshito Morita

EXHAUST GAS DISPOSAL CONTROL METHOD AND DEVICE FOR OXYGEN UP-DRAFT CONVERTER.

(Sanzo uwabuki tenro ni okeru hiagasu shori seigyō hōō oyobi sono sochi). Text in Japanese. (Nippon Steel Corp. (Japan)) Japan. Pat. Sho 47-6004. 7p., Feb. 21, 1972. (Appl. April 22, 1968, 2 claims).

This invention pertains to the method designed to effectively control the volume of air to be taken into the exhaust gas produced during oxygen steel processing by a converter. The exhaust gas collector duct-like hood is located immediately above the throat of the converter. Mounted onto the skirt of the hood is a sleeve duct that can slide up and down on the hood to adjust the opening between the converter throat and the sleeve duct. The hood is connected to the exhaust gas duct leading to the first-stage dust collector, venturi tube, second-stage dust collector, and suction fan, in that order. A flow control damper provided to control the quantity of the exhaust gas flowing through the exhaust gas duct is located between the second-stage dust collector and the suction fan. A gas sampler is also installed at a suitable location in the exhaust gas duct. The sampler is directly connected with a gas analyzer located outside of the duct. The continuously changing (carbon monoxide + carbon dioxide) % of the exhaust gas detected is then transmitted to the comparator combined with a reference meter. The reference meter provides the comparator with reference value of the CO+CO₂ content predetermined according to the oxygen-blowing smelting conditions that change with time. The comparator is also connected to the flow control damper via a control device designed to adjust opening of the damper. Therefore, the opening of the damper is automatically adjusted on the basis of deviation of the actual (CO+CO₂) % from the prefixed reference value, thus consequently adjusting the air intake according to the CO+CO₂ value of the exhaust gas.

59574

APTIC NO. 73384

Jo, Y., M. Yoshida, S. Kato, T. Tsuchida, and N. Iwai

EXHAUST GAS RECIRCULATION (EGR) IN 4-CYCLE GASOLINE ENGINES. (4-Saikuru gasorin enjin no haiki saijunkan (EGR)). Text in Japanese. Nihon Jidosha Kenkyusho Hojo Jigyo Hokokusho (Japan Auto Res. Inst., Inc., Rept.), vol. 1972:24-42, March 1972. 4 refs.

Relationships and considerations in installing exhaust gas recirculation systems (in particular, for nitric oxide) in 4-cycle engines are discussed. Parameters involving engine design, driving characteristics, exhaust and engine performance must all be considered, and their accurate relationships must be ascertained. Experimental relationships were studied between NO emission rate and fuel consumption rate upon installation of EGR in a 4-cycle, single cylinder OHC engine. The combustion chamber was hemispherical; volume was 322.3 cc; and bore by stroke was 73 by 77 mm. Constant amounts of fuel were supplied for each cycle by means of a fuel injection nozzle and a shrouded air intake valve was also used. When NO formation is postulated as the union of nitrogen and oxygen, reduction in NO by EGR is the result of temperature reduction, just as in the case of delayed ignition. Changes in NO upon varying air-fuel ratios are the result of the geometric interaction of temperature and concentration. The relationships between exhaust purification and economics were clarified by determining experimental relationships between NO emission rate and fuel consumption rate.

59575

APTIC NO. 43050

Jones, Allen H.

AIR POLLUTION CONTROL FOR HIGH TEMPERATURE INDUSTRIAL PROCESS. Inst. of Environmental Sciences, Mt. Prospect, Ill., Proc. Inst. Environ. Sci., Annu. Tech. Meet., 18th, New York, 1972, p. 581-585. 2 refs. (May 1-4.)

The application of various control techniques to high temperature industrial processes is reviewed. In general, the high temperature itself is not necessarily a problem and sometimes even is a benefit. The often overlooked facet of high temperature pollution control, however, is the low temperature conditions that exist at startup, shutdown, and other nonstable conditions. It is here that the problems of condensation of water vapor and acids can ruin precipitators and baghouses in very short order unless auxiliary heat, insulation, or other preventive techniques are employed. General problems, including acid corrosion caused by water condensation treatment of high temperature fumes, presence of extremely fine particulate matter, and recovery of products from high temperature wastes are discussed. Usages, operating principles, advantages, disadvantages, and costs are described for electrostatic precipitators, wet scrubbers, and cloth baghouse methods employed in high temperature processes. Applications to fossil fuel fired boilers, cupolas, and iron and steel electric furnaces are described.

59576

APTIC NO. 42665

Katsumata, S.

PRESENT STATE OF ELECTRIC AUTOMOBILE DEVELOPMENT AND ITS TECHNICAL PROBLEMS.

(Denki jidosha kaiatsu no genjo to gijyutsuteki kadai). Text in Japanese. Kikai no Kenkyu (Science of Machine), 24(4):6-12, April 1972.

Electricity-driven automobiles are discussed. Various types of batteries now available or being developed for use as the main power source of an electric automobile were introduced, including the secondary batteries (lead acid, alkaline nickel-iron, nickel-cadmium, and silver zinc, metal-air, lithium-electrolyte, and others) and the fuel batteries (oxygen-hydrogen, hydrocarbon, hydrazine, and methanol). All practical versions of electricity-driven automobiles introduced so far use the lead battery. Electric energy of about 4 KW is required to drive a light car at 40 km/hr. The problem is the low energy density of the battery which is 40 WH/kg. A lead battery is being developed that can give the energy density of 60 WH/kg or 50% increase from the present level. Performance and operating economy of an electric automobile are compared with the gasoline engine automobile. The disadvantages include short travel range per charging, long battery-charging time, battery expense and battery size.

59577

APTIC NO. 43779

Kitani, S., K. Takahashi, and S. Uno

STUDIES ON THE ALKALI RESISTANCE FOR AIR-FILTER MEDIA FOR OFF-GAS SYSTEMS OF FAST REACTOR. (Kosokuro haikibei ni shiyo suru eafiruta rozai no tai arukarisei shiken). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 10(2):37-54, June 1972. 1 ref.

The alkali resistance of several air-filter materials for off-gas systems of fast reactors were tested using 40% sodium hydroxide as the reagent. Tests on the aerosol collection efficiencies and particulate retention capacities of the materials were also conducted. Materials made of polypropylene fiber, carbon fiber, or stainless steel fiber are the best in alkali resistance, and fine fibers of carbon and stainless steel are good in capability as the filter material for aerosol collection. For the use as filter material for off-gas system of a fast reactor, finer fibers having large particulate retention capacity are required. Stainless steel fiber and carbon are both low in particulate retention capacity. Polymer materials are high in

aerosol collection efficiency but high in particulate retention capacity.

59578 APTIC NO. 45239

Kobayashi, Toshio and Takayuki Yoshikawa

OXIDATION CATALYST. (*Sanka shokubai*). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-24354. 4p., July 5, 1972. (Appl. Nov. 17, 1969, 1 claim).

A catalyst for oxidation of carbon monoxide from automotive exhaust gas or petroleum combustion gas is described. A mixture containing more than 1% of cadmium oxide and one or more metal oxides including cobalt oxide, manganese oxide, copper oxide, nickel oxide, zinc oxide, iron oxide, and chromium oxide is used as the catalyst for low-temperature oxidation. The catalyst is obtained by mixing the oxides or by oxidation and combustion of the nitrates. Due to the presence of the CdO, complete oxidation of CO is possible at 100-230 C.

59579 APTIC NO. 39351

Koyama, Susugu, Shigenori Komura, Yasumasa Ishibashi, Yuzo Yamashita, Yasuo Saito, Koji Tashiro, Shozo Sugita, and Tesuji Hayashi

TECHNICAL DEVELOPMENT OF MITSUBISHI-LURGI GAS CLEANING PLANT. *Mitsubishi Juko Giho* (Mitsubishi Heavy Ind., Tech. Rev.), 8(3):264-277, March 8, 1972.

Gas-cleaning equipment supplied by a Japanese firm includes electrostatic precipitators, centrifugal collectors, venturi scrubbers, and filters. Some test results are presented for the effects of electrode distance, dust concentration and resistivity, and gas distribution on precipitator performance. Ways in which the performance of the other dust collectors was improved are discussed. These included decreasing the diameter of the centrifugal collector and installing an outlet vane, development of a nozzle injection system and variable throat mechanism for the venturi scrubber, and development of a twist-layer filter strong enough to withstand mechanical vibration. Factors to be considered in the choice of gas-cleaning plant are outlined together with ways of minimizing corrosion and explosion problems. Special design requirements are summarized for the steel industry, the cement industry, power stations, the nonferrous metal and chemical industries and refuse incinerators.

59580 APTIC NO. 72648

Lang, C. J., G. G. DeHaas, J. V. Gommi, and W. Nelson

RECOVERY FURNACE OPERATING PARAMETER EFFECTS ON SO₂ EMISSIONS. Preprint, Weyerhaeuser Co., Longview, Wash., and Combustion Engineering, Inc., Windsor, Conn., 6p., 1972. 11 refs. (Presented at the Alkaline Pulping Conference, Memphis, Tenn., Sept. 11-14, 1972.)

Data from tests on various kraft recovery furnaces designed to determine the effects of operating parameters on sulfur dioxide emissions are reported. Sulfur dioxide emissions showed a strong dependence on the temperature of the burning char bed, with an increase of 100 F resulting in SO₂ decreases of about 20 ppm. An increase of 1% in dry solids content gave a decrease in SO₂ emission of over 20 ppm. Sulfur dioxide was reduced as the moisture in the combustion air was reduced, with a decrease in the latter of 0.01 lb water/lb dry air resulting in a 20 ppm SO₂ decrease. In one test the use of hearth burners (fueled by 1.5% sulfur-containing oil) decreased the SO₂ concentration from 400 ppm to 300 ppm.

59581 APTIC NO. 67140

Lasky, Jack S. and Ronald W. Fuest

PROCESS FOR REMOVAL OF ACIDIC MATERIALS FROM FLUIDS. (Dept. of Health, Education and Welfare, Washington, D. C.) U. S. Pat. 3,646,594. 6p., Feb. 29, 1972. 8 refs. (Appl. June 11, 1969, 29 claims).

A process for removing acidic materials such as sulfur dioxide from a fluid such as water or waste gas is described. The removal is achieved by passing the fluid through a shaped article formed from a polyolefin, a polyester, or a nylon in an admixture with a nitrogen-containing polymer. Present-day air pollution control methods using synthetic high-polymeric materials result in advantages not heretofore obtained, and yet there are inherent difficulties associated with the use of such materials. For example, certain high-polymeric materials which have high chemical stability and softening temperatures are being used in liquid and air filter media and bag collectors. When these materials are saturated with pollutants, the non-regenerable material must be destroyed or discarded. In many cases, incineration of the material results in undesirable pollutants from the combustion gases. The new material is chemically stable to acidic reagents, has a relatively high melting temperature, can remove the pollutants from the air, and can be regenerated from continual successive uses, making it an improvement over previous materials. (Author abstract modified)

59582 APTIC NO. 49030

Mallan, G. M.

CONVERTING WASTES TO MARKETABLE PRODUCTS: PROGRAM AND END RESULTS -- A CASE STUDY.

Preprint, 13p., Dec. 4, 1972. (Presented at the International Pollution Engineering Congress, Cleveland, Ohio, Dec. 4-6, 1972.)

The development of a program to convert wastes to marketable products and the end results are discussed. A pyrolysis process was used to produce synthetic fuel oil from the organic portion of household refuse. The organic and inorganic constituents of municipal waste are listed along with their commodity value, estimated percentage of recovery, and potential value. Paper fibers comprised over 70% of the organic material and it was economical to extract them prior to the pyrolysis process. Air classification followed by two-stage screening was successfully attempted to reduce the inorganic content of the waste to 4%. The feed preparation process to recover metal and glass and the pyrolysis process to recover saleable fuels are described, and the quality of the recovered glass and fuels are reviewed. The recovery process was developed at a pilot plant to determine its feasibility for full-scale commercialization. Vendor tests were conducted with several manufacturers of primary shredding equipment, and the performance of various units was reviewed. Power consumption versus particle size, and operating and maintenance costs were catalogued for several types of equipment, and the most efficient unit was identified.

59583 APTIC NO. 41418

McLeod, J., L. Ferrari, and H. Scheltema

CONTROL OF ACID FUME FROM DROSS REPROCESSING. *Australian Chem. Process. Eng.* (Sydney), 25(2):13-16, Feb. 1972. 6 refs. (Presented at the Royal Australian Chemical Institute and Institution of Engineers, Joint Symposium on Chemical Process Waste Disposal, Sydney, Australia, Oct. 12, 1971.)

The process of aluminum melting for casting into billets or castings usually involves the use of fluxes to aid in the removal of gases, oxides, or other impurities. The dross formed during this operation is continually removed by skimming from the surface of the melt. Since the dross so formed may contain appreciable quantities of entrained aluminum metal, it is the usual practice to further process the dross to recover the metal. The performance of a venturi type scrubber in controlling acidic fume from dross reprocessing operations was examined by determining the collection efficiency for various compounds in the vapor and solid phase. Acid gases were completely removed provided the scrubbing liquor was maintained with an alkalinity above pH 10. Reduction in total chlorides ranging from 67-70% was achieved and a corresponding reduction in fluoride emissions was obtained;

CONTROL METHODS

59590

the collection efficiency was 70-87%. It was not practicable to sample the inlet gases isokinetically and only the emissions rate for total solids was determined. The unit has been in operation for almost two years and severe corrosion has occurred which no doubt has contributed to reduced overall efficiency. Construction materials evidently play an important part in the design of liquid scrubbers to control this type of fume. (Author conclusions modified)

59584

APTIC NO. 41630

Mealey, Mike

JAPAN S TAMONO COPPER SMELTER: THE MOST MODERN IN THE WORLD. *Eng. Mining J.*, 173(6):130-131, June 1972.

Ten percent of the \$42 million cost of the Tamano smelter was channeled into pollution control equipment in 1972. A 120 ft stack vents to the atmosphere waste gases from the electrostatic precipitator and the gas bag filter of the refining furnace, as well as from the converter furnace and from the second absorption column of the adjacent sulfuric acid plant. A unique gas control system for the three 150 ton capacity Peirce-Smith converters was designed. Each converter is enclosed in a steel-like three-sided closet topped with gas control equipment. Large swinging doors at the front of the converters swing shut when the units go into operation. Waste acid from the adjacent sulfuric acid plant and waste water effluent from other Tamano operations are sent to neutralization facilities. Waste treatment is done in a limestone type plant that produces gypsum in the first stage and slime in the second stage. A complex measuring system to determine concentrations of pollutants in stack gas emissions in at ground level below the stack. The sulfur dioxide concentration reported by the company is 0.02 ppm, 1.8 ppm below the level demanded by the Japanese government. A general description of the entire smelting process is provided.

59585

APTIC NO. 49044

Mitchell, David and Graham Forder

OPTIONS ON SULPHUR REMOVAL PROCESSES ARE STILL WIDE OPEN. *Process Eng.*, 1972:130-133, Sept. 1972. 11 refs.

Processes for reducing sulfur oxides emissions from fossil fuel combustion fall into five classes: underground gasification; fuel pretreatment; combustion processes; advanced power cycle; and stack gas SO₂ removal. A number of processes typical of each class are described, together with the relationship between each of the classes and economic and noneconomic factors influencing the choice of a process. These factors are stringency of legislation, availability of raw materials, waste products, state of development, space requirements, and overall costs. The relationships between each process class and the factors are summarized in tables (for coal and oil) in which the class is scored between 1 and five for each factor. Based on these tables, the most promising alternatives for power plants in urban areas are fuel oil desulfurization and gasification. In rural areas, viable alternatives are coal washing, stack gas removal, or furnace desulfurization.

59586

APTIC NO. 83595

Moyes, A. J. and S. Vasan

HOLMES-STRETFORD H₂S-REMOVAL PROCESS PROVED IN USE. *Oil Gas J.*, 72(35):56-58, Sept. 2, 1972.

The Holmes-Stretford process for removing hydrogen sulfide from gas streams is discussed. The process, when applied to synthetic natural gas, coal gasification, or natural gas processing plants, consists of a simple, nonplugging absorber using a nonvolatile liquor. It accomplished near total H₂S removal down to the 4 ppm level, regardless of inlet H₂S concentration or pressure. This process uses low-cost materials of construction and incorporates rugged, trouble-free equipment. Since most operations are handled as liquids, the process

requires little operator attention. Because virtually all the H₂S is removed, a subsequent tail gas processing step is not required, as in the case of Claus units.

59587

APTIC NO. 50196

Nakajima, Yasuo

EXHAUST GAS RECYCLING DEVICE FOR AUTOMOBILE. (*Jidoshayo haikikanryusochi*). Text in Japanese. (Nissan Motor Co., Ltd., Yokohama (Japan)) Japan. Pat. Sho 47-34730. 3p., Sept. 1, 1972. (Appl. Oct. 19, 1970, 2 claims).

An automobile exhaust gas recirculation device is described in which the optimum volume of exhaust gas is recirculated for effective reduction of nitrogen oxides over the entire range of engine operating conditions. The intake port of the air cleaner is divided into upper and lower intake ports. The recycling exhaust gas nozzle goes into the upper port and in the lower port a control valve is linked to a diaphragm outside the air intake pipe. When pressure in the diaphragm chamber equals atmospheric pressure, the control valve opens fully. When the pressure is negative, it closes. Thus it can control air intake. The diaphragm is connected to a three-way valve which also controls the amount of exhaust gas entering the air cleaner.

59588

APTIC NO. 72750

Newcombe, G. M., J. E. Jordan, and A. V. Slack

SULFUR OXIDE REMOVAL FROM WASTE GASES BY AMMONIUM BISULFATE PROCESS. Preprint, American Inst. of Chemical Engineers, New York, 41p., 1972. 11 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 72nd, St. Louis, Mo., May 21-24, 1972.)

An Environmental Protection Agency-Tennessee Valley Authority ammonium bisulfate scrubbing process for removing sulfur oxides from stack gas is described along with pilot test results. The process involves ammonia scrubbing followed by acidification of the scrubber effluent liquor with ammonium bisulfate to evolve a rich stream of sulfur dioxide. Unique features of the method include: operating the scrubber with a high concentration of ammonium sulfate in the scrubbing liquor and promoting crystallization of the sulfate in the regeneration loop by cooling and ammoniating the acidified liquor after stripping out the SO₂. These features allow operation with a relatively low energy requirement and provide a simple way of purging sulfate from the scrubber-regenerator closed loop system. Minipilot plant (8 acfm) tests show an SO₂ removal efficiency of 93%, with crystallization in the scrubber being prevented at levels of up to 5 moles NH₃ (combined with sulfite and bisulfite)/100 moles water. The scrubbing portion was also successfully tested on a TVA 3000 cfm coal-fired steam generator.

59589

APTIC NO. 48949

Pecqueur, M.

PROSPECTIVES OF NUCLEAR ENERGY. (*Perspectives de l'énergie nucléaire*). Text in French. Ind. Miner., 54(11):509-514, Nov. 1972.

Perspectives of nuclear energy in meeting the ever-increasing energy demand are outlined. The nuclear energy production doubles every 3 years, and is mostly in the form of electricity, while other uses of nuclear energy as a direct heat source are possible. With the uranium resources of the world being limited, the development of breeder reactors is of immense importance. Nuclear power plants, subject to unmatched safety standards, cause no environmental pollution while in normal operation, and accident hazards are minimized.

59590

APTIC NO. 73506

Polevoi, R. P.

PURIFYING WASTE GASES IN A RECUPERATIVE GLASS FURNACE. *Steklo Keram. (Glass Ceram.)*, no. 9:32-33, Sept. 1972. Translated from Russian, Consultants Bureau Translation, 29(9-10):610-611, 1972.

A filter for removing dusts from waste gases generated by a recuperative glass furnace is described. The filter consists of a chamber filled with brick checkers in a chessboard fashion, with a glass collector being situated under the checker. The melter filter is installed in the flue gas stream ahead of the recuperator such that flue gases passing through the filter fall onto the surface of the checker, adhere to it, are fused, and then flow into the glass receiver.

59591

APTIC NO. 41379

Rayfel D. O. F. and V. P. Chernikov

DUST REMOVAL ON THE FUEL SUPPLY CIRCUIT.

(Obdsplyvaniye na trakte toplivopodachi). Text in Russian. Elektr. St. (Moscow), no. 5:67, 1972.

An automatic device for dust removal from coal feed conveyors is described. Water, admitted under a pressure of 3-5 kg/sq cm into a foam generator, is blended with a foaming agent (surface-active agent dissolved in water), and the foaming solution thus obtained is sprayed through a 1.5 by 1.5 mm mesh screen to form foam on the coal being fed into the furnace. The ratio of the foam to the foaming solution volume can be varied from 400 to 500 by controlling the air supply. The foaming agent expenditure is 10-15 g/ton of fuel. The device has high efficiency with low water consumption. Dust concentration was reduced from 397 to 9.7 mg/cu m in a test case.

59592

APTIC NO. 40909

Reznitski, I. G., V. S. Beskov, M. G. Slinko, and Y. P. Ermakov

INTENSIFICATION OF OXIDATION OF SO₂ FROM SULPHUR IN THE PRODUCTION OF SULFURIC ACID VIA SHORT ROUTE. (Intensifikatsiya protsessy okisleniya SO₂ iz sery v proizvodstve sernoy kisloty po korotkoy skheme). Text in Russian. Khim. Prom. (Moscow), no. 1:36-39, 1972.

To determine the temperature control range for the first catalyst layer required to obtain uniform temperature after the first layer in short route sulfuric acid production with increased initial sulfur dioxide concentration, the catalyst activity variations were studied as a function of time with different SO₂ concentrations. The relative activity variations were inversely proportional to the calculated catalyst quantity. The average activity decreased by 1.5-2.5 times during a year, and the decrease was especially intense with high SO₂ concentrations. The experimental data revealed a necessary temperature control range of 410-450 C for the first catalyst layer. The temperature profile for the first layer showed considerable decrease in activity towards the end of the layer. The decrease in activity in the upper part of the layer was due to contamination, while that in the lower part to thermal deactivation. Decreased activity was found in the second layer, no changes occurred in the third through fifth layers. With parameters altered, the temperature profile required a long time for its recovery, particularly with low temperature and sulfur dioxide/trioxide conversion rates below 0.6. Thus, the initial temperature required variations within a wide range, by changing the parameters of the furnace or the economizer. During the start-up period, however, a more delicate control was required in a range of 30 C by means of water cooler following the evaporating section of the economizer, the initial SO₂ concentration being 10-11%. By introducing the above SO₂ concentration, the productivity of the process could be increased by 20%.

59593

APTIC NO. 42062

Ruhl, Emil

THERMAL AND CATALYTIC GAS CLEANING PROCEDURES. (Thermische und katalytische Abgasreinigung). Text in German. Chem. Tech., 1(5): 219-224, May 1972.

While the trend in waste gas purification favors thermal combustion, because catalytic combustion often suffers from catalytic poisons present in waste gases in trace quantities not detectable by the usual analytical methods, the latter process is cheaper than thermal combustion in the case of gases with low concentrations of combustible components. The thoroughness of combustion of oxidizable pollutants in waste gases depends on the combustion temperature and the dwell period. Combustion, even with excess oxygen, first leads to the formation of carbon monoxide, followed by combustion of carbon dioxide at above 750 C. Waste gas is first preheated in a heat exchanger, or consumer gas or fuel oil are added before the waste gas reaches the combustion chamber. The gas or oil burners must be regulable within a wide range because of the wide fluctuation in the content of the combustible components in the waste gas. In catalytic combustion, the flash point of oxygen-containing pollutants is lower than that of paraffins, where it depends on chain length. Catalytic combustion differs from thermal combustion in that no CO forms as a primary combustion product. The catalysts are spherical or cylindrical granules or formed ceramic elements of different geometric designs, most frequently honeycombs, impregnated with salts of precious metals. Catalytic poisons include: halogens and their compounds; silicon, potassium, arsenic, and selenium compounds; and organic metal compounds. Comparative cost analysis of thermal and catalytic combustion shows that the calorific content of the waste gas in the absence of catalytic poisons is the decisive factor in the choice between one or the other procedure.

59594

APTIC NO. 46160

Saito, Takeshi and Tatsuyuki Takahashi

OXIDES OF NITROGEN FROM ACCELERATING GASOLINE ENGINE. Bull. JSAE (Japan Soc. Automot. Engrs.), no. 4:66-74, 1972. 3 refs. (Also appeared in Trans. Soc. Automotive Engrs., no. 1, 1970.)

Oxides of nitrogen exhausted from an accelerating gasoline engine were measured in an attempt to determine the effect of engine variables and to compare the results with emissions from a cruising engine. An engine bench test which simulated road operating conditions gave better accuracy and reproducibility than the chassis dynamometer test. Nitric oxide emissions during acceleration could not be quantitatively estimated from cruise condition emission unless the air-fuel ratio in addition to the engine speed and manifold vacuum were identical in both operating cycles. Since the NO emissions increased in the latter half of the accelerating mode due to mixture weakening, NO could be reduced by optimizing the air-fuel ratio, idling, and ignition timing. A method to estimate exhaust gas volume during acceleration is given. Carbon monoxide and nitrogen dioxide were also measured.

59595

APTIC NO. 49531

Sakurai, Goro, Masuo Tanaka, and Susumu Fujita

SOME EXAMPLES OF EXPERIMENTAL RESULTS OF PASS-THROUGH PHENOMENON OF FINE POWDER IN BAG FILTER DUST COLLECTION. (Baggu firuta ni okeru funjin no fukimore ni kansuru jikkenrei). Text in Japanese. Funtai Kogaku Kenkyu Kaishi (J. Res. Assoc. Powder Technol., Japan), 9(6):407-410, Nov. 1972. 5 refs.

Factors thought to cause pass-through in a bag filter were investigated. With a 100-micron mesh nylon cloth filter, the initial pass-through of dust was great, but decreased drastically 30 sec after start. It then stabilized at a lower level 2 min after start. The dust first arrested by the filter accumulated on the filter to form a dust layer which reduced the amount of dust which passes through the filter. After dust was shaken off the filter, the filter was again used. With repeated filter use, the initial pass-through quantity decreased but increased after a certain number of repeated uses. This increase might have been due to breakup of the bridging between fibers resulting from the repeated shaking of the filter. When the permeability was the same, the pass-through quantity increased as the rate

CONTROL METHODS

of infiltration increased. A filter cloth with higher permeability gave greater pass-through.

59596

APTIC NO. 46641

Sefton, Verner Blakey and Frederick James Hopton

TWO STAGE DESULFURIZATION OF WASTE GAS, ESPECIALLY SMOKE REGENERATING CATALYST BY REACTION WITH CO. (*Verfahren zum Entfernen von Schwefeldioxid Abgasen, insbesondere Rauchgasen*). Text in German. (Ontario Research Foundation, Toronto) Ger. Pat. 1,901,171. 4p., March 16, 1972. (Appl. Sept. 4, 1969, 1 claim).

Waste gases containing sulfur dioxide are contacted with a hydrogen sulfide-containing gas in the presence of a catalyst at 50-150 C. The catalyst is regenerated by reacting the sulfur deposits with a carbon monoxide-containing gas to form carbonyl sulfide. In a separate chamber the COS is hydrolyzed over a catalyst to H₂S in the presence of steam at 200-350 C, and the H₂S is recycled after condensation to remove unreacted sulfur.

59597

APTIC NO. 41040

Shevalenko, I. S., S. Z. Belinskiy, and L. I. Bragilevskaya

HIGH-VOLTAGE SUPPLY SOURCES FOR ELECTRICAL FILTERS. (*Vysokovol'tnye istochniki pitaniya dlya elektrofiltrov*). Text in Russian. *Energetik (Moscow)*, no. 3:35, March 1972.

Latest developments in power supply and control techniques for electrical filters are reviewed. Maximum filter efficiency is obtained with maximum electrode mean voltage, which is dependent on the number of sparks in the electrical filter. Because the flashover is preceded by a fairly wide zone of spark discharge, the maximum mean voltage will correspond to a certain optimum rather than to the maximum spark frequency, since increases in the latter first cause the mean voltage to rise and then to drop. The principal factors determining spark discharge are value, wave form and stability of the voltage applied, type of electrode, composition and density of the gas, temperature, humidity, dust concentration, and thickness and resistivity of the dust layer. A new supply unit with a special Tsems spark frequency control is described. The optimum spark frequency is automatically maintained by this semi-conductor type unit as a function of the gas parameters. Another electrical filter was equipped with a Triton universal control system for extremum, proportional, and periodical control. A power thyristor control unit for impulse supply, making potential gradients of 6-7 kV/cm possible, is being developed.

59598

APTIC NO. 41092

Simko, A., M. A. Choma, and L. L. Repko

EXHAUST EMISSION CONTROL BY THE FORD PROGRAMMED COMBUSTION PROCESS- PROCO. Preprint, Society of Automotive Engineers, Inc., New York, 22p., 1972. 4 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1972, Paper 720052.)

Ford's Programmed Combustion (PROCO) concept represents a middle ground approach to the pollution cleanup problem, as it is based on the present reciprocating piston engine. The Ford Stratified Charge Combustion Process which utilizes direct fuel injection was further developed for reduced exhaust emissions. With air throttling, exhaust gas recirculation, low thermal inertia exhaust manifold, and a noble metal catalyst, low gaseous emissions were achieved at low mileage on a 1/4 ton military utility truck with acceptable fuel economy and driveability. Dynamometer and vehicle emission data and details of the fuel injection and air-fuel ratio control system are described. Nitric oxide, carbon monoxide, and hydrocarbons are reduced.

59601

APTIC NO. 49403

59599

Suwu, Yu and Masami Shimizu

SODIUM SULFITE MANUFACTURING METHOD FROM A GAS CONTAINING LOW-CONCENTRATION SULFUR DIOXIDE. (*Teinodo nisanikaiwo ganyugas yori arisan natoriyumu no seizohoho*). Text in Japanese. (Showa Denko K. K., Tokyo (Japan)) Japan. Pat. Sho 47-49436. 4p., Dec. 12, 1972. 1 ref. (Appl. Aug. 28, 1967, 1 claim).

An economical process was designed to manufacture high-purity sodium sulfite from waste gases such as the stack gas of thermal power plant boilers that contain low concentration sulfur dioxide. In this process, the gas containing low-concentration SO₂ is scrubbed with water solution of ammonium sulfite to convert SO₂ into acid ammonium sulfite (NaHSO₃). A pressure steam is applied to this water solution of ammonium sulfite and acid ammonium sulfite for direct contact with the latter, thereby pyrolyzing the latter to obtain a mixture gas of steam and concentrated SO₂ containing a small quantity of ammonium, and a water solution of ammonium sulfite. This mixture gas is, without being cooled, reacted with a caustic soda water solution to produce a sodium sulfite slurry. The steam produced in this stage of the process is pressurized and recirculated for use to pyrolyze acid ammonium sulfite as mentioned above. The ammonium sulfite water solution obtained from the above-mentioned pyrolysis of acid ammonium sulfite is added with a necessary amount of water and ammonium from time to time and is recirculated for scrubbing and waste gas. The SO₂ still remaining in the stack gas is scrubbed as above and is scrubbed with a sodium sulfite water solution; it is converted into acid-sodium sulfite. This water solution is then mixed with the above-mentioned slurry of sodium sulfite. Finally, sodium sulfite is separated from this mixed slurry.

59600

APTIC NO. 47121

Tamura, Takaaki and Chikara Kato

METHOD OF CARBON MONOXIDE REMOVAL FROM AIR OR FLUE GAS. (*Kukichu aruiwa haikichu no issanka tanso o jokyō suru hoho*). Text in Japanese. (Kachita Co., Ltd. (Japan)) Japan. Pat. Sho 47-39472. 2p., Oct. 5, 1972. (Appl. Oct. 16, 1968, 1 claim).

A method of cleaning air or flue gas containing carbon monoxide by changing CO into harmless CO₂ is discussed. The cleaning bed is packed with catalyst particles consisting mainly of natural zeolite mixed with copper oxide and manganese oxide. The polluted gas is passed through the layer for a given period of time, and then the direction of the air current is reversed and the gas is again passed through the bed in the reverse direction. The CO is changed into CO₂ while repeating the action continuously.

59601

APTIC NO. 76214

Tseng, Lui-Hsieh

DESULFURIZATION WITH ACTIVE MANGANESE OXIDES. Text in Chinese. *Tai-wan Huan Ching Wei Sheng*, 4(1):13-16, 1972.

Flue gas desulfurization by active manganese oxides having a general formula of MnO_x·nH₂O, obtained by reacting manganese sulfate with ammonia and oxygen, is described. Flue gas from a preheater was led to the bottom of an absorbing tower to which active manganese oxides were introduced. Sulfur dioxide and sulfur trioxide in the flue gas were converted to manganese sulfate while the mixture was passing through the tower. The manganese sulfate and the unreacted manganese oxides were removed by a multi-cyclone and an electrostatic precipitator. The manganese sulfate was recovered and sent to a regenerating tower. Ammonium sulfate was obtained as by-product. The process has the advantages of low pressure loss, and easy recovery and regeneration of the manganese sulfate. Results of the flue gas desulfurization at a power plant (capacity 150,000 N cu m/hr) showed up to 99.6% desulfurization and 99.98% dust removal.

59602

APTIC NO. 36010

Tsutsumi, Shigeru

PROBLEMS OF TECHNOLOGICAL DEVELOPMENT IN PETROCHEMICAL INDUSTRY. *Chem. Economy Eng. Rev.*, 4(1):9-12, Jan. 1972.

New proposals are presented on the desulfurization of bottom residues consisting mainly of asphalt, with emphasis placed on the disposal of waste plastics and elastics aimed at preventing pollution. In view of the fact that most of the oil being consumed in Japan is imported, the Japanese economy is faced with a need to change from the traditional consumption-oriented economy to a new system and structure geared to the saving of limited resources. Sulfur removal from heavy oil is carried out at about 150 atm and 450 C with a sulfide of nickel, cobalt, or molybdenum as the catalyst. A new desulfurization method using microwave irradiation is described, and processes aimed at the recovery of useful materials are indicated. (Author summary modified)

59603

APTIC NO. 42164

Wallner, J. -P.

THE EQUIPMENT DESIGNER'S POINT OF VIEW. (*Le point de vue des constructeurs d'appareils*). Text in French. *Pollut. Atmos. (Paris)*, 14(54):149-151, April-June 1972.

The contribution by heating equipment designers to air pollution control is outlined. The basic fuels used in France for domestic heating are fuel oil, gas, and electricity, while coal consumption steadily decreases. Electricity, an ideal source of energy for domestic heating, generates air pollution at power plants. Gas, particularly natural gas, is the best fuel regarding air pollution. Low-sulfur fuel oil, burned at medium temperature and in the presence of excess air, generates practically no particulate pollutants and nitrogen oxides. Improvements achieved during the last 20 years resulted in heating units which cause less pollution and are more economical. Boilers with efficiencies above 80% have been developed. This fact, along with the use of low-sulfur fuel oil, suggests the superiority of a great number of small heating units to a few central facilities regarding air pollution. Heating units maintained and operated properly are less expensive in their operation and generate less emission. Research is conducted by three basic laboratories in close cooperation.

59604

APTIC NO. 40892

Weineck, Hans and Robert Goergen

ENVIRONMENTAL PROTECTION AND STEEL INDUSTRY - PROBLEMS AND SUCCESSES. (*Umweltschutz und Stahlindustrie - Probleme und Erfolge*). Text in German. *Stahl Eisen (Duesseldorf)*, 92(6):232-237, March 16, 1972. 13 refs.

Problems and achievements within the field of environmental pollution controls in the steel industry are reviewed. New technologies for steel production are viewed no longer solely from a point of economy but also from a point of how harmful they are to the environment. The share of the total emission of gaseous and particulate matter from steelmaking processes is 14% as compared with that of traffic at 42%. At the first stage of steel production, the preparation of the raw material, dusts are emitted. The waste gases from sintering plants contain sulfur dioxide and fluorine compounds. The blast furnace waste gases no longer pose problems since they can be cleaned to residual dust concentrations of 3-5 mg/cu m. Emission from steel plants have decreased to 10% in 1969-1970. Despite enormous production increases, the dust sedimentation decreased from 313,000 to about 245,000 tons. The SO₂ emission concentration has also decreased between 1963 and 1969 from 0.24 to 0.15 mg/cum. The major cause of pollution reductions is process and design modifications of furnaces.

250

59605

APTIC NO. 40969

White, Letcher T.

DUST-ELIMINATING COAL-MINING APPARATUS. (*Assignee not given*). U. S. Pat. 3,640,580. 11p., Feb. 8, 1972. 9 refs. (Appl. July 24, 1969, 11 claims).

A helix having hardened steel points fixed at spaced points along the edge of the helix is advanced into a vein of coal laterally of the helix, and means is provided for moving the helix vertically to mine coal throughout the height of the vein. Elimination of coal dust may be accomplished by spraying water from the top of a confined space to pick up and precipitate dust particles, or air may be evacuated from the confined space to continuously carry off dust-laden air. In the prior art, mechanically mined coal was loaded by expensive loading apparatus, while in the present construction, the coal is moved endwise of the trough directly to a conveying apparatus. Where a vacuum pump is used for evacuating the compartment, the intake of the pump communicates with a portion of the conveying means which is housed to carry off the fine coal dust from the stream of coal moving with the conveyor. Air is exhausted from the compartment through the conveying means to eliminate dust in the compartment.

59606

APTIC NO. 38026

Yunghahn, Richard J.

AIR POLLUTION CONTROL IN PAINT FINISHING OPERATIONS. *Metal Finishing*, 10(2):81-82, Feb. 1972

The high percentage of volatile solvents and partially combusted hydrocarbons in the exhaust from paint-finishing ovens in metal fabrication plants makes the installations a major source of air pollution. A vapor incineration system with a heat recovery apparatus provides effective pollutant control (97-98% efficiency) and is very economical to operate. A typical operating cost versus capital cost curve is shown for an incinerator with a closed-loop air-to-thermal liquid heat recovery system. In actual practice, the incineration system can be one of four types. Important requirements of the incinerator design are intimate contact of the air with the burner flame, thorough turbulence of the air beyond the burner, and proper residence time at high temperature.

59607

APTIC NO. 40862

Zenz, F. A. and H. Krockta

THE EVOLUTION OF GRANULAR BEDS FOR GAS FILTRATION AND ADSORPTION. *Brit. Chem. Eng. Proc. Tech.*, 17(3):224-227, March 1972. 15 refs.

While gas adsorption has been practiced industrially for many decades, the apparently straightforward adjunct of particulate filtration by passing dusty gases through granular filter beds has eluded engineering practicality on a large scale for nearly a century. Particle filtration via porous membranes rests primarily on the formation of a filter cake, removable by a reverse flow of fluid when the resistance of the cake or the pressure drop exceeds any desired level. The porous membrane may take the form of a bed of particles or for that matter a mat of fibers. In the early 1950s a granular bed filter was introduced which circumvented the thermal shock failure of sintered beds by avoiding reverse flow cleaning and instead continuously circulated a loose bed of granules, plus collected dust, over a vibrating screen. Some 10 years ago, the Fuller Company attempted to develop a high temperature gravel bed filter which was to retain the high efficiency of stationary granules, circumvent the fouling action of unremovable penetrated fines, and hopefully lessen the burden of circulating immense quantities of gravel. The Lurgi organization proposed to circumvent the bed circulation entirely, while the Ducon filter employs an expanded bed, the fluidization providing a simple non-mechanical cleaning method. Operating principles of each of the methods are discussed, including advantages and disadvantages. The most successful development to date has been the Ducon filter. Combined filtration and adsorption are considered.

CONTROL METHODS

59608

APTIC NO. 42792

Association for Industrial Pollution Control (Japan)

STUDIES ON BASIC DESIGNS FOR KP MILL BAD ODOR CONTROL (1). (KP *kojo akushu boshi taisaku no tame no kihon sekkei ni kansuru kenkyu* (1)). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 8(7):441-466, July 1972.

Odor pollution at various Kraft Pulp Mills in Japan was thoroughly investigated. After the studies, analyses of emission gases, specific emission sources, and treatment methods for each source were recommended. The main sources of bad odor emissions are the cooking process (15-30%), scrub filter (5-8%), vacuum evaporation process (6-10%), recovery boiler (40-50%), and others (10-15%). The processing and emission sources are presented by flowsheet diagrams and the findings from on-site investigations are presented in tables. The recommended treatment methods follow: for the batch-type cooking process, steaming vessels should be improved so that bad odor does not leak outside, and the collected gas should be burned in a special furnace. The emission gas from the vacuum evaporation process should be absorbed by caustic soda, and the stripper condensation drainage should be cooled in a condenser and burned in a kiln. Black liquor should be oxidized by contact with the air and converted into sodium thiosulfuric acid. The recovery boiler flue gas should be emitted without coming into direct contact with the black liquor, but by pre-heating the air by laminar heater, so that the emission gas will not contain hydrogen sulfide. The investigation revealed that H₂S was absorbed well by chlorine or alkali, but caustic soda solution absorbed methylmercaptan better; chlorine absorbed dimethylsulfide better; and hypochlorous acid soda solution absorbed both very well.

59609

APTIC NO. 47780

BISCHOFF INSTALLATION DEVELOPMENT PROJECT. (Entwicklungsvorhaben Bischoff-Verfahren). Labor and Social Ministry of North Rhine-Westphalia, Duesseldorf (West Germany) and State Inst. for Immission Control and Soil Conservation, Essen (West Germany), 29th Interim Rept., May 1972. Translated from German. Translation Consultants, Inc., Arlington, Va., 12p., 1972.

During the test period of a Bischoff installation, the degree of desulfurization was 78-87% for 110,000 cu m/hr of stack gas and 80-88% for 120,000 cu m/hr stack gas. Breakdowns which occurred, work on the installation, scrubber fouling, installation fouling, rock and soil tests, and additional findings during the test period are indicated. The blower impeller was easily cleaned by hosing with water under high pressure, and high settling tank efficiency was improved by increasing the sludge drainage volume. A special coating on wearing parts proved satisfactory.

59610

APTIC NO. 48611

ERANDE SETS PILOT PLANT TO BURN HIGH-SULFUR COAL WITH LOW SO₂ DISCHARGE. *Oil Gas J.*, 70(47):83-84, Nov. 20, 1972.

A regenerative-limestone fluidized-bed boiler system operating at atmospheric pressure was developed for the control of sulfur dioxide emissions from high-sulfur content coal combustion. The limestone combines with the sulfur from the coal to produce calcium sulfate and is regenerated in a second reactor by a reducing gas. Over 90% of the SO₂ is removed in the fluidized beds. The sulfated lime is regenerated to yield an off-gas with 7-12 mole% SO₂ for conversion to sulfuric acid or elemental sulfur. The design parameters and operating variables of the continuous fluidized-bed combustion-limestone regeneration unit are reviewed.

59611

APTIC NO. 67137

ALUMINUM FLUORIDE FROM WET PROCESS PHOSPHORIC ACID WASTES. *Brit. Chem. Eng. Proc. Tech.*, 17(7/8):609-610, July/Aug. 1972. 1 ref.

The wet phosphoric acid process evolves large quantities of fluorine compounds; upwards of 40-45 fluosilic acid kg/ton phosphoric anhydride emitted is recoverable. The present capacity of the fertilizer industry is enough to supply virtually the entire aluminum industry with the fluorine compounds it requires, particularly aluminum fluoride. A process capable of producing AlF₃ from H₂SiF₆ solution arising from the scrubbing of the waste gases evolved in the production of phosphoric acid is described. Variable costs for this process are cited. An approximate estimate of the investment for a plant to produce 100 tons/day of AlF₃ is \$752,000. An analysis is presented of investment distribution by different sections of the process and by function.

1971

59612

APTIC NO. 43076

Abowd, Richard G., Jr.

JET FUEL ADDITIVE. (Ethyl Corp., New York) U. S. Pat. 3,558,292. 3p., Jan. 26, 1971. 4 refs. (Appl. Dec. 20, 1968, 9 claims).

A method is presented for reducing the manganese deposits formed on the surfaces of jet engines from burning fuel which contains organomanganese compounds as a smoke reducer. The deposits are reduced by adding a nonmetallic organic sulfur compound to the organomanganese-containing fuel. Cyclopentadienyl manganese tricarbonyl compounds are useful organomanganese compounds; dialkylxanthates are useful organic sulfur compounds. (Author abstract modified)

59613

APTIC NO. 43075

Barron, Alvah V., Jr.

FAN APPLICATION FOR HIGH ENERGY SCRUBBERS. Technical Assoc. of the Pulp and Paper Industry, New York, Tappi Eng. Conf., 26th, Proc., 1971, p. 609-622. (Nov. 18.)

Kilns, recovery boilers, and other systems that use high energy venturi scrubbers can operate with fans that are smooth, surge free, respond quickly to control, and are without hunting and pulsation. Regard for some simple application rules in system design can prevent both problems with the system and the difficulties and expense of solving them after installation. Careful attention to the volume control method is necessary to prevent system hunting, including the requirement of flat fan curves and the inability to use variable speed drives. The high pressure-to-volume requirement of typical applications offers high inertia starting problems that must be considered. Using fans on the dry or positive side of high energy scrubbers leads to the need for special seals to prevent shaft puffing and attention to housing construction features. (Author summary modified)

59614

APTIC NO. 35223

Bernstein, L. S., K. K. Kearby, A. K. S. Raman, J. Vardi, and E. E. Wigg

APPLICATION OF CATALYSTS TO AUTOMOTIVE NOX EMISSIONS CONTROL. Preprint, Society of Automotive Engineers, Inc., New York, 17p., 1971. 10 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 11-15, 1971, Paper 710014.)

Nickel-copper alloys, marketed under the name Monel, are extremely active oxides of nitrogen reduction catalysts. At temperatures above 1300 F, and under net reducing conditions, Monel will catalyze the removal of 90% or more of the nitric oxide in automotive exhaust at space velocities of up to 100,000 v/v/hr. On unleaded fuel, Monel catalysts have shown

good activity maintenance in mileage accumulation runs as long as 31,000 miles. Catalyst life is limited by physical deterioration of the catalyst which causes increases in exhaust back pressure. The presence of lead in the fuel substantially increases the rate of Monel deterioration. When Monel is used as part of a dual-bed catalyst system, two problems arise which appear to be generic to dual-bed catalyst systems. First, under normal operating conditions, roughly 10% of the nitric oxide in the untreated exhaust reacts with hydrogen to form ammonia in the Monel bed. The NH_3 thus formed can be oxidized in the oxidation bed. Ammonia formation can be decreased by careful control of exhaust composition. Alternatively, the concentration of NO in the untreated exhaust can be lowered by exhaust gas recycling, so that even with ammonia formation, the nitric oxide concentration in the treated exhaust will be low enough to meet low emissions standards. Second, placing Monel or any other NOx reduction catalyst ahead of the oxidation catalyst slows the warm-up of the oxidation catalyst. This problem has been attacked by placing the catalyst system close to the exhaust ports and modifying the exhaust system to conserve exhaust gas sensible heat. (Author abstract modified)

59615

APTIC NO. 76252

Bhatia, S. P. and S. Prahacs

REMOVAL OF SULPHUR COMPOUNDS FROM KRAFT RECOVERY STACK GASES WITH ALKALINE SUSPENSIONS OF ACTIVATED CARBON. PART 1: LABORATORY INVESTIGATIONS. *Canadian Pulp and Paper Assoc., Technical Section, Canadian Pulp and Paper Association Air and Stream Improvement Conference*, 6th, Quebec, 1971, p 266-273. 12 refs. (April 13-15.)

The use of alkaline suspensions of activated carbon for the absorptive removal of hydrogen sulfide, methyl mercaptan, methyl sulfide, and dimethyl disulfide from simulated kraft recovery furnace stack gas is described. Collection efficiencies as high as 99.8% can be obtained over 3-hour periods, and the activated carbon shows little or no poisoning. The cost of the carbon for removing 90% of the total reduced sulfur compounds at an original emission rate of 20 lb/ton of pulp is estimated to be 3-6 cents/ton of pulp. This cost can be reduced considerably if the activated carbon is produced on-site from black liquor or if fly ash carbon of sufficient activity is available at the mill. The effect of oxygen and sulfur dioxide in the flue gas on the alkaline suspension of activated carbon is to increase the capacity of the absorbent for both H_2S and CH_3SH .

59616

APTIC NO. 40867

Bignon, M.

SULFUR IN THE PETROLEUM - POLLUTION OR TREASURE. (*Le soufre dans le petrole. Pollution ou richesse*). Text in French. *Entropie*, no. 41:123-127, Sept.-Oct. 1971. 9 refs.

Various processes for the removal of sulfur from natural gas petroleum products, and their combustion gases were reviewed. Acid natural gases contain hydrogen sulfide, and sulfur is present in the form of mercaptans and thiophenes in the distillates. Dehydration by means of glycol is required in a cold climate, and the extraction from acid gases is made primarily with diethanolamine, and with diglycolamine in some cases. The amount of sulfur recovered from natural gas totals some 1.5 million tons yearly in France. The hydrogen sulfide present in liquefied gas can readily be removed by distillation, and quasi-total recovery is provided by molecular filters. The usually low sulfur content in gasolines can be converted into H_2S and eliminated by means of amines following stripping, or hydrogenized in the presence of a cobalt-molybdenum catalyst. For high requirements, chemical absorption with zinc oxide is applied. Kerosene, intended for use in reactive drives, is treated similarly to gasoline. Gas oils are hydrogenized in the presence of a cobalt-molybdenum catalyst with simultaneous denitrification and heavy metal removal. Non-desulfurized

residues may be added to low-sulfur. Expensive hydrogenation obtain products with 1-1.5% of sulfur. Expensive hydrogenation or hydrocacking can be applied for sulfur removal. Microbiological methods for crude oil desulfurization failed to be successful. While the waste gas desulfurization is not economical, techniques yielding elementary sulfur should be preferred to those yielding sulfuric acid or sulfates. Dolomite and limestone powder injections into the hearth are favorable. The Claus method, developed for sulfur recovery from hydrogen sulfide, has a maximum output ratio of 96%. Emissions from non-recovered H_2S are efficiently controlled by recent developments.

59617

APTIC NO. 44979

Brandt, Allen D. and David M. Anderson

THE CONTROL OF INDUSTRIAL AIR POLLUTION SOURCES. *Dept. of Commerce, Washington, D. C., Bureau of International Commerce, Environ. Control Sem. Proc.*, Rotterdam, Warsaw, Bucharest, 1971, p. 199-212. 26 refs. (May 25-June 4.)

NTIS: PB COM-72-50078; GPO

Efforts to control air pollution have increased in the past 2 years, a period during which profits have fallen. The total investment required to control air pollution from the major process industries between 1970 and 1976 is approximately \$3,900,000. Particulate matter is the major pollutant released from most industrial processes, and includes fumes, mists, and smoke. Gaseous pollutants, such as sulfur dioxide, hydrocarbons, fluorides, and carbon monoxide are problems for a few specific industries. Controlling a point source is purely a problem in gas or air treatment, while control of a mobile source is much more evasive because technology is frequently not available. Control of particulate emissions may be achieved through process changes and operational changes, or through particulate removal equipment. Treatment facilities include centrifugal separators, fabric filters, scrubbers, and electrostatic precipitators. It is expected that by 1980 the emission rate from industrial air pollution sources in the United States will be reduced by at least 90% from 1967 levels. Industrial sources include mineral processing, kraft pulping petroleum refineries, metallurgy, fertilizer manufacturing, and rubber manufacturing. Other sources are transportation, electric generation, forest fires, and solid waste disposal.

59618

APTIC NO. 35711

Chaput, H.

URBAN TRANSPORTATION AND EMISSION. *Preprint, Society of Automotive Engineers, Inc., New York*, 14p., 1971. 8 refs. (Presented at the Society of Automotive Engineers, Mid-Year Meeting, Montreal, Quebec, June 7-11, 1971, Paper 710559.)

Measures taken by one urban transit company to reduce emissions from diesel buses are reviewed. Major stress is placed on the use of instruments, not only for inspection, diagnosing, and correcting obvious faults which cause blue and black smoke, but also for monitoring engine deterioration and indicating when motor and torque oil should be changed. Since engine wear and fuel dilution are important causes of troublesome emissions, a fixed replacement and rebuild policy is followed, and motor oil is regularly tested for viscosity. Exhaust emissions have been reduced by needle valve fuel injectors, while ground-level fume concentrations and ground-level noise have been controlled by use of vertical stacks with aspirators. Air starters enable engines to be shut off during layovers without repeated heavy battery drain when starting again.

59619

APTIC NO. 79212

Condry, Linda Z. and Gerald E. Moore

SULFUR DIOXIDE REGENERATION FROM MODIFIED FLYASH. *West Virginia Univ., Morgantown, Coal Research Bureau, Rept. 82*, 11p., 1971. 4 refs.

CONTROL METHODS

59624

Sulfur dioxide regeneration properties of modified coal fly ash (the solid, disposable by-product of alkaline-earth techniques for fixing gaseous sulfur oxides from coal combustion in boilers) were studied by heating samples of fly ash to specific conditions in a neutral atmosphere. When heated in a neutral atmosphere, alkaline earth modified fly ash will evolve sulfur dioxide gas at temperatures as low as 1300 F and usually within 15 min of heating. Sulfur dioxide gas is generated in concentrations suitable for use by industry. The evolution of sulfur dioxide gas enhanced the natural cementitious properties of the limestone-modified wet-collected fly ash tested. (Author abstract modified)

59620

APTIC NO. 67064

Creutz, William L. and Albert W. Deurbrouck

COAL AND THE SULFUR PROBLEM. Preprint, 18p., 1971. (Presented at the World Energy Conference, 8th, Bucharest, Romania, June 28- July 2, 1971, Paper 2.3-28.)

The use of coal by electric utilities, coal resources in the U. S., and processes for reducing sulfur in coal are reviewed. Several sulfur control methods are discussed in detail, including washing of coal and removal of sulfur oxides from combustion gases by throw-away processes (dry and wet limestone), by catalytic and regenerative processes (catalytic oxidation, alkaline scrubbing, and the Stone and Webster Ionics System), and by other processes. A combined coal washing and gas cleaning operation may be necessary to obtain the 1% sulfur content in coal necessary for utility fuel. Of the mines examined east of the Mississippi River, only 35% contained less than 1% organic sulfur coal. Using present coal washing technology, perhaps 20% of the mines will be able to produce an acceptable product; the remaining coal will only be usable if gas cleaning or combined washing/gas cleaning processes are developed. (Author conclusions modified)

59621

APTIC NO. 35717

Frevel, Ludo K. and Leonard K. Kressley

METHOD OF REMOVING SULFUR DIOXIDE AND PARTICULATE MATTER FROM GASEOUS STREAMS. (Dow Chemical Co., Midland, Mich.) U. S. Pat. 3,589,863. 3p., June 29, 1971. 2 refs. (Appl. March 8, 1968, 11 claims).

Most existing or proposed methods for the removal of acid gases and particulates from stack or flue gases are cumbersome and expensive, and involve multiple steps. Moreover, the processes do not provide for the simultaneous removal of both acid gas and particulate matter. Typical of these methods are the limestone scrubbing, manganese dioxide, and vanadium pentoxide processes for sulfur dioxide removal. Highly efficient removal of SO₂ and/or particulates is achieved, and useful by-products obtained, by passing the gas stream through a bed of porous alkali metal bicarbonate aggregates at 50-130 C. The bed can be a fixed system or a countercurrently moving, replenished system. The porous aggregates attract the particulate matter to their surfaces and thus remove them from the stream, while the sulfur dioxide and other acid gases are simultaneously reacted within or around the aggregates to form solids which leave the gas stream. With this method, the final concentration of SO₂, sulfur trioxide, hydrogen bromide, hydrogen chloride, or hydrogen sulfide is often less than 10 to 20 ppm. Similar, more than 90% of any particulate matter is usually removed. The preferred alkali metal is sodium bicarbonate, although lithium, potassium, rubidium, and cesium bicarbonate can be employed.

59622

APTIC NO. 40205

Gleason, R. J. and J. D. McKenna

SCRUBBING OF SULFUR DIOXIDE FROM A POWER PLANT FLUE GAS. Preprint, American Inst. of Chemical Engineers, New York, 43p., 1971. 15 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 69th, Cincinnati, Ohio, May 16-19, 1971.)

Control of sulfur dioxide emissions from a coal-fired power generating boiler using a flooded disc venturi scrubber in series with a packed tower was studied on a 1000 cfm pilot scale system. Lime scrubbing of sulfur dioxide in a flood disc scrubber provided 50 to 55% SO₂ removal. To establish this efficiency, a pressure differential across the disc of 15 to 10 in. and water were provided. The flooded disc scrubber and packed tower scaled severely with quicklime absorbate. Packed tower SO₂ absorption with quicklime, limestone, and soda ash was measured at 99, 90 and 98%, respectively, at approximately the same operating conditions. Scale formation in a limestone/SO₂ system can be controlled. Deposition of the reaction products in the irrigated areas of the tower was significantly reduced by high liquid-to-gas ratio, a high reaction product slurry concentration, and desupersaturation of the slurry prior to recycle. Confirmation of the performance and reliability characteristics of the Howden-ICI limestone system was obtained, and this system was improved upon by the employment of a unique fixed bed wetted-wall type packing. The packing has low pressure drop characteristics and a relatively high surface area (68 sq ft/cu ft). Commercialization of the limestone system appears justified. (Author abstract modified)

59623

APTIC NO. 43108

Goergen, Robert

AIR POLLUTION CONTROL IN IRON METALLURGY - FUTURE TRENDS. (Kontrolle der Luftverschmutzung in der Eisen- und Stahlindustrie - Entwicklungstendenzen). Text in German. Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 6:1-6:11. 6 refs. (Sept. 1-6.)

Air pollution control and related future trends in the iron metallurgy of West Germany are described. Emissions (dust, sulfur dioxide, fluorine, and other pollutants) from metallurgical plants cause nuisances of a temporary and local nature. Fine dust, SO₂, and fluorine are emitted by agglomerating plants, very fine dust of 0.01-0.1 micron (brown smoke) by steel mills, and SO₂ by rolling mills. The heavy fuel oil used contains 1.6% sulfur and a maximum of 10 ppm fluorine. Dust emissions from blast furnaces are controlled by electrostatic filters or wet dust separators, securing a maximum dust concentration of 3-5 mg/N cu m. Electrostatic filters and wet-type separators provide satisfactory dust separation for brown smoke. Electrostatic filters, wet processes, and particularly tissue filters are used for electric-arc and ultra-high-power furnaces. The SO₂ emissions from open-hearth furnaces have decreased considerably due to the increased use of low-sulfur fuel oil or natural gas. As a result of the installation of modern pollution control devices, the shutdown of obsolete plants, and other control measures, the 1969-1970 pollution level was one tenth the 1956-level. The volume of dust sedimented over the Ruhr area decreased from 312,000 tons in 1963-1964 to 250,000 tons in 1967-1968, while the SO₂ concentration decreased by 40% from 1963-1969. Authorization is required for the alteration of existing plants and the construction on new ones. While both the Thomas and Siemens-Martin processes show a downward trend, the proportion of converter steel increases. A three-stage steel manufacturing process, including agglomeration, direct reduction with sulfur-free gas, and electric melting without overheating, is being developed.

59624

APTIC NO. 84496

Hause, Rolf R.

CLEANING OF PAINT-OVEN EXHAUST AIR: A EUROPEAN VIEW. Preprint, Industrial Furnishing Magazine, p. 1-9, 1971. (Presented at the Problems of Pollution Conference, Chicago, Ill., Dec. 1971.)

Pollution rules and laws in industrialized European countries for paint oven exhaust air are described. In Germany, the oven exhaust air has to be cleaned to reduce the carbonic elements of the combustible organic media to values below 300 milligram/standard cu m/hr. Recommended maximum exhaust pollution concentrations are set. Various hydrocarbons are

classified and limited. Chromatography or spectrography are used to determine pollution contents. Total combustible carbon is measured with a silica gel method or by flame ionization detector. Methods to clean the paint-oven exhaust air are presented. Thermal incineration is most successful. Oven exhaust air is preheated in a heat recovery exchanger, brought up to the necessary temperature, and then used to heat up a thermo-liquid. The extra heat can be discharged. Every zone including fresh air can be regulated separately for optimum heat balance of the oven. It can be run economically by selecting the heat exchanger size so that the input energy of the burner is close to the required energy of the oven. Thermal incineration with catalysts, is economical, with reduced fuel consumption and less engineering and manufacturing problems, but unless the type of paint being used is known, catalysis cannot be used. Poisons may damage the catalysts. A third possibility is air-washing by absorption and condensation. Usually it is very difficult to absorb solvent vapors. But in EC paint drying ovens there aren't many solvents; there are vaporized softness, products which have a bad smell. These can be condensed and absorbed.

59625

APTIC NO. 73387

Hayashi, Hiroshi, Takayoshi Sugimoto, and Iwao Nemoto
STUDIES ON EFFICIENCY TESTS FOR EXHAUST PURIFICATION CATALYSTS. (Haiki joka shokubai seino shikenho no kenkyu). Text in Japanese. Nihon Jidosha Kenkyusho Hojo Jigyo Hokokusho (Japan Auto. Res. Inst., Inc., Rept.), vol. 1971: 48-69, June 1971. 9 refs.

Performance tests on catalytic reactors are outlined, and tests on catalyst activity alone and evaluation of exhaust purification catalyst activity are described. Tests on catalytic reactor performance should be conducted in four steps: tests on catalysts alone; tests on reactors alone; laboratory tests by engine and chassis dynamometer; and road tests. Previous tests have been conducted by catalyst manufacturers under steady and clean environmental conditions, but it is necessary to conduct tests under actual unsteady and dirty conditions for automotive engine exhaust systems. Catalyst life and equipment durability must also be considered under actual operating conditions. When enough data have been assembled, performance evaluation can be conducted by simulation. Evaluation of catalyst activity in exhaust purification can be effected by observing results of predetermined temperature pattern changes in reaction gas temperatures, instead of merely testing at a constant temperature. Procedures to be followed in the initial screening of catalysts suitable for exhaust purification are described. An accurate reflection of actual automotive conditions is necessary in order for screening to be of any real value. In experiments to determine catalyst activity, attention must be paid to the sample gas on these three points: its space velocity and situation of catalyst; composition; and temperature. Metal (platinum, palladium, rhodium, and ruthenium) and metal oxide (cupric oxide) catalysts were used in the experiments. Effects of steam (detrimental for metal oxide catalysts), carbon dioxide (initially detrimental), secondary air supply (i.e., oxygen, erratic), carbon monoxide (detrimental to metal oxide catalyst activity at low concentrations), are described. Determination of space velocity of sample gas was based on regulation modes, and was based on equations such as SWEPT VOLUME, PS 2%, and PS 3%. It is necessary to have the catalyst layer more than 4 cm deep, but the reaction does not usually occur as a diffusion process and diffusion mechanisms need not be considered too closely.

59626

APTIC NO. 42439

Healy, George W.

PHYSICAL CHEMISTRY AND STOICHIOMETRY OF SILICON MONOXIDE EMISSIONS. Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers (AIME), New York, 13p., 1971. 3 refs. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, New York, Feb. 26-March 4, 1971.)

The economic motive for controlling emissions from silicon metal furnaces was the recognition that it cost almost as much to convert silica to silicon monoxide fume as to convert it to silicon metal: 3.4 theoretical kilowatt-hours to make a pound of silicon contained in fume and 3.7 kilowatt-hours to make metal. The efforts made to decrease fume production were very successful, so that a typical loss of around 40% of the feed as fume in the 1930s was lowered to about 10% in the 1950s. The two reactions which describe the stoichiometry of metal and fume productions are indicated, as well as influencing variables such as pressure and temperature. If furnaces were made much deeper than at present, a considerable increase could be expected in higher temperature condensation to silicon carbide. If this were complete enough, then the remaining silicon monoxide would be insufficient to cement and plug up the upper mix layers, and a continuous fume-free operation would be possible.

59627

APTIC NO. 42456

Holowaty, M. O.

PROCESS FOR REMOVING ZINC FROM STEELMAKING DUSTS. Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers (AIME), New York, 42p., 1971. (Presented at the American Inst. of Mining, Metallurgical and Petroleum Engineers Annual Meeting, New York, Feb. 26-March 4, 1971.)

Steelmaking dusts contain zinc and lead oxides in amounts ranging from a few tenths of 1% to above 30%, depending on the type and grade of scrap used in the steelmaking operations. These zinc and lead contents make it impossible to use the dust in conventional sintering operations, since the oxides attack viciously the refractories and bring about rapid deterioration of the blast furnace lining. Oxy-pelletizing experiments were carried out to determine the balling characteristics of open-hearth dust received in the form of wetted balls produced in a Stirling drum. The minus-20 mesh dust showed excellent balling properties. Bench-scale tests were followed by a semipilot program. The results showed that the technique of mixing steel precipitator dust and a carbonaceous reductant such as coke breeze or coal can be used for dezincking of dust pellets provided maximum kiln temperature is kept under 2200 F to avoid pellet fusion and formation of wall accretions; satisfactory zinc elimination can be achieved at 2000-2100 F. Zinc-bearing precipitant emanating from the kiln with effluent gases contained between 40-65% zinc and the quality of the iron-bearing pellets leaving the kiln was regarded as satisfactory with zinc contents around 0.2% or less. Another test program allowed for the variation of size and zinc contents of pellets in order to establish equipment performance under various controlled conditions. A regional plant employing existing technology and equipment and producing a ferrous product in the form of briquetted sponge iron was designed for sufficient capacity to service several steel companies.

59628

APTIC NO. 38695

Keränen, T. W. and H. P. Wertheimer

A STUDY OF SPARK-IGNITION-ENGINE CONTROL VARIABLES. Bendix Tech. J., 4(3):40-50, 1971. 10 refs.

Systematic testing of a fuel-injected 429-cu in. V-8 engine at steady states produced data to define the effects of air-fuel ratio ignition timing, and percent of exhaust-gas recirculation on emission levels and fuel economy. As a function of these variables, data on brake-specific nitric oxide, hydrocarbon; and carbon monoxide emissions and fuel consumption were plotted. Exhaust-gas recirculation permitted NO control with a lower fuel-consumption penalty than extremely rich operation alone. Nitric oxide control was important at both high and low power levels hydrocarbons were a greater problem at low power levels. An optimum engine size for a given vehicle weight is postulated. Simulation of warm-engine emission tests for comparing various control approaches indicated that entirely different calibrations are needed for different emission-performance goals. (Author abstract modified)

CONTROL METHODS

59634

59629

APTIC NO. 41378

Klimecek, Rostislav

THE PROBLEM OF REMOVAL OF INDUSTRIAL EXHALATIONS. (*Problem odstranovani prumyslovych exhalaci*). Text in Czech. Chem. Prumysl (Prague), 21(12):615-618, 1971. 6 refs.

Current concentrations of gaseous effluents emitted by the Czechoslovak chemical industry, control methods used, and desulfurization processes of gaseous effluents from thermal power plants were investigated. Total emission from chemical factories was 20,000 tons of sulfur dioxide and 3500 tons of sulfur trioxide; thermal power plants contributed approximately two million tons, with an additional 220,000 tons from the transportation industry, 150,000 tons from metallurgical plants and 400,000 tons SO₂ from home heating installations. Control measures instituted by plants of the chemical industry included washing of end gases variously with sodium hydroxide solutions, ammoniacal solutions, sodium bicarbonate, and by catalytic oxidation to SO₃ and its subsequent absorption. While these various technologies have been satisfactory for the chemical industry, they are not adequate for the thermal power plants due to the nature of the end gases and because of the problem of final disposition of the desulfurization by-products. Washing towers which could process several million cu m waste gases/hour containing fly-ash and having a temperature of 180 C and which could purify them so that they are hot enough to disperse fast enough in the atmosphere have not yet been developed. Foreign technologies cannot be applied because combustion gases in Czechoslovakia are of different composition. Under generally prevailing conditions, recovery of sulfur is more economical than desulfurization with gas purification as an end. Other pollutants emitted amount to 9500 tons carbon disulfide, 13,500 tons hydrogen sulfide, 10,500 tons nitrogen oxides, 2500 tons chlorine, 500 tons hydrochloric acid, and 500 tons fluorine. In the case of some large plants, recovery of pollutants and their recycling is more advantageous than liquidation (catalytic reduction of nitrogen oxides in nitric acid plants).

59630

APTIC NO. 43122

Laughlin, R. G. W., F. J. Hopton, and V. B. Sefton

THE RECOVERY OF SULPHUR FROM SULPHIDE ORE SMELTER WASTE GASES, CONTAINING LOW CONCENTRATIONS OF SO₂. *Am. Chem. Soc., Div. Fuel Chem. Preprints*, 15(2):76-95, 1971. 7 refs. (Presented at the American Chemical Society, National Meeting, 162nd, Washington, D. C., Sept. 13-17, 1971.)

At low temperatures (100-120 C), the Claus reaction is suggested as the basis for a recovery process to obtain sulfur from waste gases containing low concentrations of sulfur dioxide, emitted during sulfide ore smelting. The catalyst for the reaction acts as an adsorbent for the sulfur produced. A hot reducing gas passed through the loaded catalyst strips off the sulfur and also regenerates the catalyst for further reaction and adsorption. After condensation, two thirds of the sulfur is used to produce hydrogen sulfide for the Claus reaction and the remainder may be sold to defray expenses. Several methods for hydrogen sulfide production are examined, and the reactions between natural gas and producer gas with sulfur or sulfur dioxide are discussed. Tests of the process on-site at a smelter indicate that the process would work successfully to desulfurize gases containing 1-2% sulfur dioxide by volume. Two major process flow schemes are considered, one suitable for a smelter where a strong 10-15% sulfur dioxide stream is available for hydrogen sulfide production, the other where no such stream exists. Preliminary process economics are discussed. (Author abstract modified)

59631

APTIC NO. 41997

Lowe, Robert E.

NUCLEAR POWER AND THE ENVIRONMENT. *American Ordnance Assoc., Washington, D. C., Proc. Environ.*

Pollut. Meet., 2nd, Edgewood Arsenal, Md., 1971, p. 151-158. (March 24-25.)

NTIS: DDC: AD 729929

The Calvert Cliffs Nuclear Power Plant of the Baltimore Gas and Electric Co. will produce 1,600,000 kw of power in absolute safety and without discernable negative effects on the environment. Calvert Cliffs will release 500 BTU/kw hr waste heat to the atmosphere, 1/3 the national average for power plants, and 7600 BTU/kw hr to the water of the Chesapeake Bay. This is to be handled in five cooling towers at water flow of 5400 cu ft/sec with a temperature rise of 10 F, resulting in a temperature rise of 3 F or greater for only 23 acres of the bay. Mean surface temperature increase of 0.4 F would result in the tidal segment adjacent to Calvert Cliffs. Intake water will be taken under a curtain wall below the thermocline at a velocity of less than 0.5 ft/sec. The release of radioactivity is expected to be less than 1% of permissible and will have no effect on marine or human life.

59632

APTIC NO. 43060

Metzler, A. J. and J. W. Slough

ANTIPOLLUTION SYSTEM TO REMOVE NITROGEN DIOXIDE GAS. *NASA Tech. Brief, no. 71-10393, 2p., Oct. 1971.*

A gas phase reaction system which utilizes anhydrous ammonia is described for removing nitrogen dioxide from the exhaust of an oxidant-rich hydrazine-nitrogen tetroxide rocket gas generator in a combustor test facility. The control system comprises an ammonia injection and mixing section, a reaction section, and a scrubber section. Efficiency of NO₂ removal depends on both the reaction time and the ammonia concentration.

59633

APTIC NO. 67139

Meyers, Robert A., John S. Land, Christopher C. Shih, and Jerry L. Lewis

CELLULOSES FOR THE REMOVAL OF SULFUR DIOXIDE FROM FLUE GAS STREAMS. (*TRW Inc., Redondo Beach, Calif.*) *U. S. Pat. 3,629,996, 5p., Dec. 28, 1971. 4 refs. (Appl. Feb. 19, 1970, 7 claims.)*

Sulfur dioxide contained in flue gases from a coal-burning, thermal generating plant can be sorbed on finely divided cellulose such as a shredded paper at temperatures in the range of 215-300 F. After the cellulose has been saturated with the SO₂, it is desorbed by flue gas at about 350-450 F. The desorbed SO₂ may be then conveniently forwarded to a plant for processing to sulfuric acid. Spent cellulose may be forwarded to the plant for burning or it may be further digested to carbohydrates. Previously, cellulose was not utilized commercially for SO₂ sorption, since lengthy desorption times were required and it was not known that SO₂ could be desorbed at all from the cellulose. Therefore, this process proves that within a preferred temperature range, the desorption of SO₂ from the cellulose occurs quickly. This not only permits efficient utilization of the cellulose, but also enables cycling of the cellulose from desorption to sorption and vice versa. A large cellulose inventory is thus not required, and rapid cycling permits conservation of the heat contained in the cellulose. (Author abstract modified)

59634

APTIC NO. 33624

Moriyama, Aritsune

BAG FILTER FOR POWDER DUST. (*Funjin yo baggu firuta*). Text in Japanese. (*Sanko Kuki Sochi K. K. (Japan)*) *Japan. Pat. Sho 46-24548, 2p., Aug. 24, 1971. (Appl. Sept. 21, 1968, claims not given.)*

A bag filter consisting of an inner bag and an outer bag requires no mechanical rubbing to dislodge collected dust and thus has a longer life than other bag filters. Each bag is made of flexible, highly porous material. Dust-laden air blown into the filter is first filtered by the inner bag and then by the outer bag. The filtered air is passed to a clean air chamber in the

filter case and then removed through an air pipe. Dust removed by the bags falls to the bottom of the filter case or accumulates on the filter cloth. The bag is cleaned by blowing air from another pipe through the space between the inner and outer bags. Because the bags are made of a flexible material, the air causes them to undulate violently. This violent undulation removed dust deposits from the bags, the dust falling to the bottom of the filter case.

59635

APTIC NO. 45049

Morris, W. E. and K. T. Dishart

INFLUENCE OF VEHICLES EMISSION CONTROL SYSTEMS ON THE RELATIONSHIP BETWEEN GASOLINE AND VEHICLE EXHAUST HYDROCARBON COMPOSITION. *Am. Soc. Testing Mater. Spec. Tech. Publ.*, no. 487:63-101, 1971. 9 refs. (Presented at the American Society for Testing and Materials, Annual Meeting, 73rd, Toronto, Ontario, June 21-26, 1970; includes a discussion.)

Relationships were developed that described how vehicle exhaust hydrocarbon composition is influenced by hydrocarbon composition of the gasoline and by various emission control systems which give a range of exhaust emission levels. The relationships were obtained by computer regression analysis. The gasolines, which consisted of five refinery-component blended fuels and 10 matching commercial gasolines, were all leaded premium grade with similar octane quality and volatility characteristics. The aromatic and olefin contents of the blended gasolines were varied according to a statistical design that covered the usual variation found in commercial premium gasolines. The vehicles in which these fuels were tested were equipped with no control device, conventional air injection and engine modification systems, and an exhaust manifold reactor system. Ethylene was formed from saturates and olefins, propylene and isobutylene/1-butene were formed primarily from saturates, and diolefins were formed primarily from olefins. Toluene was the most important fuel hydrocarbon from the standpoint of contribution of calculated photochemical reactivity, and survived through the vehicle in larger proportion than the other principle fuel hydrocarbons. Fuel effects on photochemical reactivity of the hydrocarbons emissions were quite small in relation to the effects of emission control systems. Calculated total photochemical activity of the exhaust from the thermal reactor car was only 2-3% of that of the cars with other control systems. (Author abstract modified)

59636

APTIC NO. 34472

Nassenstein, G.

AIR POLLUTION BY OIL FIRING INSTALLATIONS. (*Luftverschmutzung bei Oelfeuerungen*). Text in German. *Schweiz. Bl. Heizung Lueftung*, 38(3):88-93, 1971. 6 refs.

The chimney emissions from distillate fuel oil burning consist predominantly of sulfur dioxide, dust, soot, and oil odors. With a sulfur content of three to five g/kg in extra-light fuel oil, and installation of one million kcal capacity/hr will burn about 750 kg sulfur/hr, the combustion products being mostly SO₂, and some sulfur trioxide. The quantities of emerging soot and dust vary between 10 and 60 mg/cu m, which is well below the permissible limit of 150 mg/cu m stipulated by the Swiss Commission for Air Hygiene. Until a few years ago, oil odors, caused mainly by incomplete combustion and too low a flame temperature, used to be typical in the vicinity of oil firing installations. However, the emission of odors has practically disappeared due to design improvements in oil burners and boilers. In their endeavors to contribute to improved conditions, the oil industry succeeded within the last two years in reducing the average.

59637

APTIC NO. 41324

Niehaus, Conrad Franz

CONTINUOUS REFINING OF MOLTEN METALS. (*Verfahren zum ununterbrochenen Laetern einer*

Metallschmelze). Text in German. (Assignee not given.) *W. Ger. Pat. Appl.* 2,117,883. 32p., April 13, 1971. (20 claims).

A continous process for the refining of molten metals in an inclined oxygen converter removes silica, manganese, carbon, sulfur, and phosphorus from pig iron. The surface and inner layers of the melt are mixed by the oscillating rotation of the converter. The unrefined melt is charged at the top of the converter, refining fluxes at a lower point, and the refined melt is discharged continuously from the surface layer, at a point opposite to the charging place.

59638

APTIC NO. 40268

Pelton, John McLemore

AN ANALYTICAL MODEL FOR PREDICTING THE PERFORMANCE OF AN EXHAUST GAS COOLING SYSTEM (FINAL REPORT). ARO, Inc. Arnold Air Force Station, Tenn., Air Force Systems Command Contract F40600-72-C-003, Program Element 654022F, ARO Proj. RW2116, AEDC-TR-71-194, ARO-ETF-TR-71-138, 82p., Oct. 1971. 9 refs.

NTIS: AD 731140

A typical system for removing exhaust gases from an altitude test cell within a simulation facility for the testing of turbojet engines consists of cooling the exhaust gases in water spray coolers and removing the saturated exhaust gases in water spray mechanical pumping machinery. The spray cooling system may consist of a cooling chamber immediately downstream of the test cell where atomized water is mixed with hot exhaust gases to cool by saturation and dehumidification and a second cooling chamber of similar construction immediately upstream of the exhaust pumping machinery for additional cooling. An analytical model was developed to determine the operating parameters to obtain desired performance, the optimum size cooling system, and the thermodynamic properties of any two-phase flow system within the assumptions and constraints of the model. The mathematical relationship between the two spray cooling chambers and the required pumping machinery parameters and the required engine conditions was calculated. By varying the cooling water flow rate, velocity, and temperature at separate coolers in the model and specifying the maximum desired duct temperature, conditions for minimum cooler inlet pressure can be predicted. Several typical conditions are investigated using the model to show the influence of cooling water parameters on the test cell pressure. (Author abstract modified)

59639

APTIC NO. 38330

Rossenbeck, Martin

FUEL CHANGES WITH A VIEW TO ENVIRONMENTAL PROTECTION. PART II. (*Kraftstoffwandel im Zeichen des Umweltschutzes*). Text in German. *Automobiltech. Z. (Stuttgart)*, 73(12):466-469, Dec. 1971. PART I. *Ibid.*, 73(11):415-420, Nov. 1971.

The low-lead fuel with 40 g/l will cause no problems for the existing automobiles. Most of them can be driven without provoking knocking sounds. The further reduction of the lead content to 0.15 g/l will require a change to new technologies in the refineries. No definite ideas concerning these new technologies exist yet. Enormous sums of money will have to be appropriated for their development and the gasoline price will have to rise. Apart from the octane number, the antiknock property at high speeds and full load plays an important role. It will not be possible to reach the high antiknock properties of tetraethyl lead under such conditions. An adjustment of the engines to the new fuel characteristics will be necessary. There are no efficient and effective antiknock agents which could be used instead of tetraethyl lead. The use of alcohols and monomethylaniline is possible, within certain limits but they are not a full substitute for tetraethyl lead.

59640

APTIC NO. 38052

Schouw, Arthur C.

LIQUID RECOVERY APPARATUS. (Tri-Mer Corp., Owosso, Mich.) U. S. Pat. 3,616,604. 6p., Nov. 2, 1971. 15 refs. (Appl. Jan. 2, 1968, 8 claims).

A solution is presented to the problem of air pollution by combining the waste substances suspended in industrial gases with a liquid substance to form a compound that can be used in other processes or, depending on the nature of the substances, discharged into the atmosphere or water without the risk or injuring plant or animal life. An apparatus is described which will recover the compounds by introducing a liquid into industrial gases and then deliver them to a mixing chamber which has a fan for mixing the two substances together. The fan delivers the gas and liquid mixture to a tubular filter pack that separates the liquid from the gas. For purposes of illustration the apparatus is described as it could be used in the process in which liquid anhydrous ammonia is combined with sulfur dioxide and water vapor to produce ammonium sulfate which is useful as a fertilizer.

59641

APTIC NO. 41998

Sercu, Charles L.

HANDLING AND INCINERATION OF PESTICIDES, PLASTICS, AND HAZARDOUS CHEMICALS. American Ordnance Assoc., Washington, D. C., Proc. Environ. Pollut. Meet., 2nd, Edgewood Arsenal, Md., 1971, p. 199-202. (March 24-25.)

NTIS, DDC: AD 729929

The destruction of plastics, pesticides and hazardous chemicals by incineration can be accomplished safely with no effect on the environment. Materials may have to be analyzed and searches made of the literature for flash point, heat release, and viscosity. Other alternatives may need to be studied, including reductions, recycle, and reuse. Decomposition products must be known, as these often tell immediately which disposal methods not to use. Most of the pesticides, plastics, and chemical wastes are oxidized at temperatures above 800 C. The rotary kiln is flexible, continuous, and able to handle both solid and liquid waste. Secondary combustion of the gases is usually a requirement to insure complete combustion, after a furnace burning many kinds of waste. Gases from the furnace will need to be cooled, scrubbed, and demisted before discharge into the atmosphere. Burning a mixture of waste chemicals is almost certain to produce gases that require scrubbing and could present difficulties in conventional incinerators. Waters used in the process must be cooled and neutralized before discharge into the sewer. Minimization of steam plumes can be accomplished but only at a tremendous increase in both capital and operating costs. Units designed so that there is only water in the plume provide the best cost per performance ratio.

59642

APTIC NO. 35720

Shriner, Walter

AIR POLLUTION REDUCTION SYSTEM. (Assignee not given.) U. S. Pat. 3,587,210. 7p., June 28, 1971. 18 refs. (Appl. May 2, 1969, 13 claims).

An air pollution reduction device for placement in the path of a pollutant-loaded stream of hot gases, e.g., exhaust from an internal combustion engine, comprises a tubular body with four compartments, each with a baffle formed of a dielectric plastic material and a fiber-glass or aluminum filter. The baffles induce electrostatic forces that cause precipitation of the solids and their discharge to the entrainment zones. The system is an improvement over similar systems in that the electrostatic charges applied to particles in the fluid stream are intensified by openings in the dielectric walls. These effectively coalesce removal of very fine colloid particles that are especially conducive to smog formation.

59643

APTIC NO. 38345

Smitsen, Carl Ernst van der

RETENTION CAPACITY OF AEROSOL FILTERS FOR PROTECTIVE MASKS. (Aufnahmevermoege von Aerosolfiltern fuer Atemschutzgeraete). Text in German. Staub, Reinhaltung Luft, 31(9):355-358, Sept. 1971.

Filters in protective masks for aerosol retention are either made of a mixture of cellulose and glass fibers or of glass fiber alone. Mixed filters have a weight of 150 to 200 g/sq m, while glass fiber filters weigh only 60 to 100 g/sq m. The mixed filter papers have more rather larger pores than glass fiber papers. Thus it can be expected that the mixed filter papers retain more aerosols. The actual retention capacity of the two types of filters was tested with oil mist, soot, titanium dioxide, sodium chloride, and sand dust. The retention capacity of both filters was approximately the same. The different clogging properties of the various aerosols became apparent in the glass fiber filter as well as in the filter of mixed material. At the retention of sodium chloride and titanium dioxide which is representative of the separation of fine dusts, the particles penetrate rather deeply into the filter and a separation into coarse and fine particles takes place. A considerable difference between the retention capacity of a glass fiber filter and the filter of mixed material was found when the different size of the paper surface of the two filters is considered. The glass fiber filter has twice the surface of the filter of mixed material. Thus, the latter is capable of retaining about twice as much aerosols/sq cm surface than the glass fiber filter.

59644

APTIC NO. 43097

Smitt, L.

DESULPHURIZING OF FLUE GASES FROM THE SULPHITE INDUSTRY. Int. Air Pollut. Control Noise Abatement Conf. (Proc), Jonkoping, Sweden, 1971. p. 2:30-2:40. (Sept. 1-6.)

Sulfur dioxide emissions from calcium based sulfite paper mills are discussed. Tests, control results, and costs are reviewed. Two practical solutions to reduce emissions include changing to another chemical basis -- from calcium to magnesium, and introducing flue gas cleaning -- the less costly of the two solutions. The Bahco SO₂-scrubber and its operation and application as a control method are described.

59645

APTIC NO. 38271

Stolfa, Frank and Laurence O. Stine

DESULFURIZATION AND CONVERSION OF HYDROCARBONACEOUS BLACK OILS. (Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,617,502. 8p., Nov. 1971. 6 refs. (Appl. Oct. 28, 1968, 8 claims).

A process is presented for converting asphaltene-containing hydrocarbonaceous black oils into lower boiling, normally liquid hydrocarbon products. The process involves the integration of a thermal cracking coil and fixed-bed catalytic hydrogenation and desulfurization. It is especially applicable to sulfurous charge stocks containing less than 150 ppm of metallic contaminants and more than 10.0% by volume of nondistillables. The charge stock is initially subjected to a fixed-bed catalytic desulfurization and hydrogenation, and a series of separation steps to concentrate that portion of the reaction zone product boiling at temperatures above the normal gasoline boiling range. This high-boiling concentrate is then subjected to a noncatalytic, thermal cracking reaction zone or coil. (Author abstract modified)

59646

APTIC NO. 50270

Thomson, John C.

EMISSION RESULTS FROM AN AUTOMOBILE USING THE FRANTZ VAPOR INJECTION. (Environmental Protection Agency, Office of Air Programs, Rept. 72-5, APTD-1389, 4p., Sept. 1971.

The exhaust emission characteristics of a passenger car equipped with the Frantz vapor injector were studied to determine the effect of the device on emission levels of hydrocarbons, carbon monoxide, and nitrogen oxides. The system effected some emission reductions, but the results were not consistent. The best results were obtained from the vapor injector by removing the fluid. The effectiveness of the device for reducing emission was a function of the air bled into the manifold, thus resulting in a leaner air-fuel mixture. The amount of fuel used for each test is listed.

59647

APTIC NO. 40153

Tohata, Heiichiro, Seitaro Kato, and Katsumasa Suzuki

REMOVAL OF NITROGEN OXIDES (CATALYTIC OXIDATION OF NITRIC OXIDE ON ACTIVATED ALUMINA). (*Chisso sankabutsu no jogai ni kansuru kenkyu (Kassei arumina ni yoru issanka tanso no sanko hanna ni suite)*). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 6(1):173, 1971. (Presented at the National Council Meeting of Air Pollution Studies, 12th, Nagoya, Japan, Oct. 27-29, 1971.)

The catalytic oxidation of nitric oxide on activated alumina was studied by using four parallel acrylic reactors 27.5 mm in diameter and 55 mm in height, packed with eight mesh activated alumina which was previously treated at 130 C. both the nitric oxide from iron manufacturing and that from the reaction of ferrous sulfate and sodium nitrite were used. The flow rate of air was 4-10 l/min and that of the nitric oxide was 8-20 l/min. The result of the effect of humidity on the reaction rate was shown for three relative humidities at 30 C reaction temperature and NO concentration of 2000 ppm. Zero percent relative humidity showed the highest reaction rate, whereas 10% had a lower reaction rate and 50% was the lowest. The effect of moisture on the rate of reaction was introduced into a rate equation, and the optimum amount of moisture for the oxidation reaction was determined.

59648

APTIC NO. 35716

Vigil, Julio S.

CONCENTRIC ANNULAR VENTURI GAS SCRUBBER. (*Chemical Construction Corp., New York*) U. S. Pat. 3,584,440. 7p., June 15, 1971. 4 refs. (Appl. March 19, 1969, 18 claims).

An improved venturi scrubber accommodates large volumes of gas at a lower pressure drop, completely and uniformly scrubs the gas stream, and is readily assembled from standard components and materials. The apparatus features two concentric annular venturi passages for gas-liquid contact. These are provided within a vertically oriented container by concentrically disposing a central conical baffle, an annular ring-shaped circular baffle having an angular projection, and an outer form the two annular scrubbing passages that insure uniform scrubbing of large volumes of gas with low pressure drop loss. Applications of the invention include scrubbing of waste gases and scrubbing of process gas streams in chemical and metallurgical processes.

59649

APTIC NO. 45780

Visser, P. J.

DUST SEPARATION FROM INDUSTRIAL AND OTHER WASTE GASES. NOMEX FILTERS AGAINST ENVIRONMENTAL POLLUTION. (*Stofffiltratie uit industrie- en afvalgassen. Nomexfilters tegen milieuvervuiling*). Text in Dutch. Ned. Chem. Ind., no. 13:182-185, April 1971.

The properties of Nomex filter fibers and examples of practical application are described. Nomex filters, made of aromatic polyamide fibers in woven or needle-punched design, can be continuously operated at a temperature of 220 C, with a maximum of about 300 C. Such filters have a long life, outstanding tensile strength, good natural and dimensional stability, high resistance to wear, and negligible shrinkage. Nomex fibers are

superior in their acid resistance to nylon, but inferior to polyester or polyacryl, while the alkali-proofness is comparable to that of nylon. The resistance to sulfur dioxide above the dew point is excellent, and so is that against ultraviolet rays. Nomex filters can be mounted in conventional bag filter equipment, and be used in steel, aluminum, and nonferrous metallurgy, cement works, as well as in limestone and bitumen industries.

59650

APTIC NO. 41583

Wiesener, K.

USE OF ELECTROCHEMICAL CELLS FOR THE REMOVAL OF INDUSTRIAL WASTES. (*Die Anwendung von elektrochemischen Zellen zur Beseitigung von Industrieabfaellen*). Text in German. Technik (Berlin), 26(8):510-515, Aug. 1971. 15 refs.

Galvanic cells were developed to oxidize sulfur dioxide to sulfuric acid. These consist of a porous carbon anode with vanadium-aluminum mixed oxide, a platinum catalyst, and activated porous carbon as the cathode, with nitric acid as a redox transfer agent in the cathode compartment; the cathode and anode are separated by a diaphragm. These cells were used to oxidize industrial process waste gases, which were introduced directly into the anode compartment. Methane and carbon monoxide were completely oxidized by the anode; but at 25 C, the reaction was slow. Waste chlorine and hydrogen sulfide, with noble metal catalyst electrodes, resulted in currents of 250 mA/sq cm in 6 N hydrochloric acid as electrolyte, with applied polarization of 200 mV. A combination of waste chlorine with hydrogen electrode makes it possible to produce hydrochloric acid, or a concentration of aqueous hydrochloric acid and electrical energy. Hydrogen sulfide can be oxidized in alkaline media at 60 C, but not in acid where the catalyst is rapidly poisoned by sulfur. At 60 C, the sulfur dioxide oxidation progresses more rapidly, in spite of lower solubility at this temperature. The temperature should not exceed 70 C. Nitrogen dioxide is not completely removed by the cell; some nitric oxide is detected in the off gases.

59651

APTIC NO. 47539

Yanagihara, Shigeru

CONTROL OF OXIDES OF NITROGEN IN AUTOMOTIVE EMISSIONS. (*Jidosha hakki no chisso sankabutsu taisaku*). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 50(535):846-853, Nov. 1971. 12 refs.

Methods to control nitrogen oxide emissions in automotive exhaust are reviewed. As a practical application, exhaust gas recirculation and a modified air-fuel ratio combined decrease NOx emissions. However, a decrease in NOx emissions usually means a decrease in thermal efficiency thus affecting fuel economy. Nitrogen oxide formation and operating variables are examined.

59652

APTIC NO. 35808

DUST CONTROL AND FILTRATION. *Food Process. Ind.*, 40(981):44-45, Nov. 1971.

New developments in dust and odor control in food processing operations were featured at recent London exhibitions. They included an improved resin (Curit) for air purifiers, a catalytic and thermal combustion system for oxidation of odors to carbon dioxide and water, a separator permitting reuse of waste water, and a wide range of collectors for small particle recovery. A continuous automatic fabric filter that uses a high-pressure reverse-air purge system for tube cleaning was shown. The filter can be mounted on a silo or even on the roof of a factory.

CONTROL METHODS

59659

59653

APTIC NO. 41384

Industrial Gas Cleaning Inst., Rye, N. Y., Electrostatic Precipitator Div.

SURVEY OF ELECTROSTATIC PRECIPITATOR OPERATING AND MAINTENANCE COSTS. *Water Sewage Works*, vol. 18:R236-R237, Aug. 31, 1971.

A questionnaire was distributed by the Electrostatic Precipitator Division of the Industrial Gas Cleaning Institute to the utility, paper, mining and metallurgical, steel, rock products, and chemical industries in 1969. Specific questions posed by the survey covered routine maintenance inspection, internal maintenance inspection, corrosion, useful life of precipitators, actual and expected maintenance cost, operating and maintenance instructions, repair and replacement, and dust removal systems. The recommendation listed most frequently was that hoppers should be pulled frequently to prevent grounding and burning of discharge electrodes.

59654

APTIC NO. 42234

Chemical Construction Corp., New York, Consulting Div.

THE HIGH SULFUR COMBUSTOR. VOLUME II. DESCRIPTIVE DETAILS (FINAL REPORT). *National Air Pollution Control Administration Contract CPA 22-69-151*, 479p., Feb. 1971. 64 refs.

NTIS: PB 203959

The pyritic sulfur content of some bituminous coals can be reduced by gravimetric separation or washing. The extraction of energy and sulfur value contained in the reject fractions is technically feasible. Under favorable conditions the sale of extracted energy and sulfur products will to some degree offset the cost of washing. Designs and evaluations of several combustion and flue gas treating systems for processing high sulfur fuels that may be drawn off from the rejects of coal washing are examined. Certain combustion systems designed to make use of high-ash high-sulfur reject materials from coal cleaning by means that will generate steam and permit the recovery of sulfur value are evaluated with respect to fuel specifications and characteristics; combustor design details; test procedures; ash production, marketing, and application, process descriptions; utility requirements; and costs. These fuels will need to be made up to specifications that depend first on the requirements of available processes for sulfur value recovery, and second on the limitations of combustion equipment in respect of ash. The HSC fuel specifications can evidently be satisfied by appropriately re-combining selected portions of reject material from deep cleaning of coal. Four specimen HSC fuel compositions are tabulated together with product and cost data on six processing systems for these fuels. (Author abstract modified)

59655

APTIC NO. 43018

National Council for Stream Improvement, Inc., New York

PRESENT TREATMENT PRACTICE OF AIR-BORNE EFFLUENTS IN THE UNITED STATES KRAFT INDUSTRY. *Tech. Bull. 2*, 18p., Nov. 1971. 7 refs.

The kraft pulping industry was surveyed with regard to the emission of particulate, aerosol, and gaseous contaminants; the types of recovery equipment used; specific abatement techniques for various effluents; costs of abatement processes; and the public relations aspects of the problem. High efficiency air cleaning equipment is used in the various stages of the kraft process, at capital costs of about \$1000/ton of productive capacity. The composition of the air-borne effluents from the main kraft operations, i.e., digestion, chemical recovery, and auxiliary power generation includes hydrogen sulfide, methyl mercaptan, dimethyl sulfide, dimethyl disulfide, sodium sulfate, carbonate, fly ash, fine particulates, and sulfur dioxide. Control methods applicable in the industry are electrostatic precipitators and venturi scrubbers for recovery furnace stacks; wet scrubbers and dry dust collectors for lime kiln exhaust; and odor counteraction through the turpentine recovery system, burning, oxidation of sulfur compounds, scrubbing, caustic solutions, and odor masking reagents.

59656

APTIC NO. 81535

State Committee for Construction of the Council of Ministers, USSR

PRICE LIST FOR INSTALLATION OF EQUIPMENT NO. 15. EQUIPMENT FOR SCRUBBING GASES. (*Tsennik na montazh oborudovaniya, No. 15, Oborudovaniye dlya ochistki gazov*). Publishing House of Literature for Construction, Moscow, 17p., 1971. Translated from Russian, 14p.

A price list for the installation and operation of electrostatic precipitators and mechanical collectors at various industrial operations throughout the USSR is presented. The list includes a breakdown of costs associated with installation, operation, material resources, and labor requirements for specific industrial sources of particulate pollution.

1970

59657

APTIC NO. 83449

Behrens, Knut, Hermann T. Brandt, Erich Hoeffken, and Werner Kleine-Kleffmann

THE NEW BASIC OXYGEN STEEL PLANT OF AUGUST-THYSSEN-HUETTE AG (WEST GERMANY). (*Das neue Oxygenstahlwerk (Sauerstoffaufblas-Stahlwerk) der August Thyssen-Huette AG*). Text in German. *Stahl Eisen (Duesseldorf)*, 90(2):53-63, 1970.

The new basic oxygen steel plant of August-Thyssen-Huette AG at Bruckhausen, West Germany, comprising two top-blown oxygen converters with 350 ton/hr capacity each is described. The hot flue gases are cooled in a saturating venturi, where coarse dust is separated, after which fine dust is separated in a Pease-Anthony venturi with water injection. The residual dust content is less than 150 mg/cu m. Carbon monoxide is burned off in high torches at 85.4 m altitude.

59658

APTIC NO. 51191

Berlin, Z. L., A. N. Golitsyn, A. I. Kunakhovich, G. V. Maslovskii, A. G. Serkov, and V. Y. Yakimovich

PRINCIPAL TRENDS IN THE DEVELOPMENT OF EQUIPMENT FOR THE EFFICIENT RECOVERY OF HEAT FROM THE WASTE GASES OF NON-FERROUS METAL PROCESSING FURNACES. *Soviet J. Non-Ferrous Metals*. (English translation from Russian of: *Tsvetn. Metal.*), 11(5):14-17, May 1970. 7 refs.

The design features of a new standard series of horizontal fire-tube waste heat boilers for nonferrous metallurgical furnaces are described. The series includes four boilers for reverberatory furnaces, two for oxygen-enriched blast furnaces, two for converter smelting, and three for fluidized-bed furnaces. The boilers are characterized by lack of change in gas flow direction at the boiler inlet, thus preventing the deposition of molten metallic particles on the heating surface and the slagging of the radiant-heat walls of the boiler chamber, by low gas velocity and ample cross section of the gas flue for gas flow between heating surfaces, thus ensuring low gas resistance in the boiler and loosening of deposits, by use of natural circulation, thus increasing the reliability of heating surfaces; by high-temperature preheating of air for the furnace, and by the possibility of controlling waste gas temperature of the desired level. This controlled cooling of waste gases should enable full recovery of valuable components of fine dusts and sulfur dioxide contained in the gases.

59659

APTIC NO. 41329

Guth, Hans

CATALYTIC OXIDATION OF SULFUR DIOXIDE TO SULFUR TRIOXIDE. (*Verbessertes Verfahren zur katalytischen Oxydation von SO₂ zu SO₃*). Text in German. (Farbenfabriken Bayer A. G., Leverkusen (West Germany)) W. Ger. Pat. Appl. 2,026,818. 12p., June 2, 1970. (4 claims).

259

Sulfur dioxide is catalytically oxidized to sulfur trioxide in many contact steps with intermediate absorption of the SO₃ formed after 80 to 90% of the SO₂ has been converted. Prior to entry of the SO₂-laden gas into the first contact step, about 2 to 10% by volume of the SO₃ is added. For this purpose a branch of the necessary diluting air is passed through an oleum-sprayed tower. By this method dangerously high temperatures which destroy the catalyst are avoided.

59660

APTIC NO. 35709

Haigh, D. H. and R. H. Hall

EXPANSIVE IMBIBITION FOR PRACTICAL POLLUTION PARTICULATION, OR, SEPARATING THINGS FROM STUFF. Preprint, Society of Automotive Engineers, Inc., New York and The American Chemical Society, Washington, D. C., 3p., 1970. (Presented at the Society of Automotive Engineers, and the American Chemical Society, Joint Meeting, Midland, Mich., Oct. 24, 1970, Paper 710654.)

Imbibitive polymers can be utilized for oil-slick cleanup, for cleaning contaminated mercury containers, and for removing organic vapors from gas streams. For vapor absorption determinations, a hypodermic syringe with a glass wool plug near the middle is loaded with imbibitive polymer to 0.5 ml graduation. Atop this is placed 0.1 ml of fine silica sand. A control is also prepared in which the entire bed of particles in the syringe is composed of sand with nearly the same surface areas as the polymer. In operation, 0.3 microliter of the liquid organic to be tested is placed on the sand layer in such a way that there is no contact between liquid and polymer. The plunger is then reinserted and the syringe and contents are allowed to equilibrate for five minutes. The gas is then exhausted through the bed into the injection port of a gas chromatograph and analyzed. The decrease in organic is expressed as percent reduction and is arrived at by comparison of the amount of organic remaining in the air after passing through the polymer particles with the amount remaining after passing through sand. Reductions obtained for 10 organic vapors are shown.

59661

APTIC NO. 33874

Hirsch, Marc-Roger

PROCESS FOR THE REMOVAL OF NITRIC OXIDE FROM INDUSTRIAL GASES. (Procédé pour l'enlèvement d'oxyde nitrique contenu dans des gaz industriels). Text in French. (Montecatini Edison S.P.A., Novara (Italy)) French Pat. Appl. 2,016,722. 9p., May 8, 1970. (9 claims).

The process described completely removes nitric oxide from industrial gases in a single operation. It does not require the introduction of oxidants, avoids the formation of nitroresins, does not require a compressor, and requires only one column. NO is precipitated by absorption of gases containing 50 to 200 ppm NO in an aqueous solution of iron salts down to a content of less than 1 ppm. The washing solution contains 2 to 5 M of an iron salt, 0.1 to 0.4 M of an ammonium salt, and 0.1 to 5 M ammonia. The countercurrent washing is realized at 10-50°C, the contact time is 10-50 sec. The iron salt is iron chloride or iron sulfate; the ammonium salt is bicarbonate, carbamate, carbonate, or chloride. From 1 to 20 liters of solution is required for the washing of 100 liters of gas. FeSO₄·7H₂O, a by-product of TiO₂ manufacture, is cheapest to use. The washing is best accomplished in a column partly or completely filled with iron which, attacked by the ammoniacal solution, continuously replenishes the iron ions being removed by the formation of a nitric complex. The process is especially suited for the purification of cracking gas. Before removing NO from cracking gas, CO₂ should be removed so as to avoid the carbonation of the ammoniacal solution.

260

59662

APTIC NO. 41386

Humphries, James J., Jr. and Wayne A. McRae

THE STONE AND WEBSTER/IONICS SULFUR DIOXIDE REMOVAL AND RECOVERY SYSTEM. Proc. Am. Power Conf., vol. 32:663-672, 1970.

A sulfur dioxide removal and recovery system is described, for power plant boiler flue gases based on the reaction of sodium hydroxide with sulfur dioxide in flue gases to form sodium sulfite and bisulfite. These two compounds are reacted with sulfuric acid, generated internally, to form sulfur dioxide, which is recovered as a pure gas, and sodium sulfate. The sodium sulfate is processed in an electrolytic cell to generate caustic and sulfuric acid, which are recycled. The operating costs of the process are recoverable from the profits from the sale of acid. Costs are discussed in detail.

59663

APTIC NO. 22355

McCoy, J. D. and F. B. Hamel

EFFECT OF HYDRODESULFURIZING PROCESS VARIABLES ON CORROSION RATES. American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst., Sect. III, vol. 50:844-877, 1970. 10 refs. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.)

The effect of hydrodesulfurizing process variables on high temperature corrosion rates of chrome-moly and austenitic stainless steels are evaluated using gaseous mixtures of hydrogen-hydrogen sulfide. Test conditions include concentrations of 0.03 to 10.6 volume% of hydrogen sulfide; temperatures of 600 F, 750 F, and 900 F, and pressures ranging from 100 psig to 2000 psig. Corrosion rate data are obtained at intervals of 330, 830, 1600, and 2500 hr for 9 Cr, 410, 430, 304L, 321, and Incoloy 800 materials. Of the three process variables studied - hydrogen sulfide concentration, pressure, and temperature - temperature is the only variable having a significant effect on corrosion rates above 1.0 mole% H₂S. A uniform rate of corrosion does not occur until after 300 hr of exposure and the formation of a tight adhering iron-chromium sulfide film. Microprobe analyses show that the innermost layer contained an enrichment of FeCr₂S₄. From this rate data, curves are constructed which show the expected long-term corrosion rates versus temperature. From an over-all point of view, the sulfidation reaction is best represented as a fractional order rate rather than a parabolic rate. (Author abstract modified)

59664

APTIC NO. 24237

Rixmann, W., K. E. Hailer, and K. E. Schmid

STATE OF DEVELOPMENT AND PROBLEMS OF INTERNATIONAL MOTOR VEHICLE ENGINEERING. (Entwicklungsstand und Probleme der internationalen Kraftfahrzeugtechnik). Text in German. ATZ (Automobiltechnische Zeitschrift (Stuttgart)), 72(9):335-347, Sept. 1970. PART I. Ibid, no. 8, 1970.

Papers presented at the 13th FISITA Congress, held at Brussels, Belgium, June 1970 are reviewed. The maximum permissible pollutant levels emitted by automobiles projected for 1975 will be met only if solutions will be found for many hitherto unsolved problems. The exhaust gas decontamination of the Ro 80 rotating combustion engine by afterburners, the reduction of Diesel-engine smoke emission by electronically controlled fuel supply, the formation of exhaust gases in the combustion chamber, the motors and steering gear for electromobiles are reviewed. Inspection and servicing emerged as an increasingly important factor in traffic safety. Automobile inspection, accident causing defects, the success of voluntary automobile supervision in West Germany, passive safety devices (safety belts, integrated seats), the simulation of dynamic properties of materials under the impact of energy, safety glass in windshields, and the introduction of a safety program are discussed. The capacity of the human body for collision impacts, the deformation of the human thorax through impact against the sternum, determination of the

CONTROL METHODS

tolerance limit to brain concussion in animals by impact and centrifugal force, and determination of tolerance limits to injury in accidents are also presented.

59665

APTIC NO. 34818

Rosenbloom, William J.

POSITIVE CONTROL OF AIR AND STREAM EMISSIONS FROM AN ORGANICS PLANT. Vanderbilt Univ., Nashville, Tenn., School of Engineering, and Tennessee Stream Pollution Control Board, and Tennessee Dept. of Public Health, Nashville, Environ. Water Resources Eng. Conf., 9th, Annu., Nashville, Tenn., 1970, p. 179-183. (June 4-5.)

The pollution prevention system at Mobil Chemical's Mount Pleasant organics facility is described, as well as some of the alternatives that were considered in order to make the plant pollution-free. An organo-phosphate pesticide called Mocap is produced at the plant. Some of the raw materials used in its manufacture have an odor threshold measured in parts per billion and the effluent exceeds allowable receiving stream limits by as much as 620 times for dissolved solids, 138,000 times for phosphorus pentoxide, and 550 times for BOD. A liquid waste treatment system is described which utilizes hydrochloric acidification and boiling. Exhaust systems and other air pollution control equipment are also indicated.

59666

APTIC NO. 23692

Satterfield, C. N.

HETERO-HOMOGENEOUS CATALYSIS OF AIR POLLUTANTS. Massachusetts Inst of Tech., Cambridge, Dept. of Chemical Engineering, NAPCA Grant AP00513, 34p., 1970. 38 refs. (Presented at the International Symposium on Chemical Reaction Engineering, 1st, Washington, D. C., June 8-10, 1970.)

Hetero-homogeneous reaction refers to a process in which free radicals or other intermediates are formed on a solid catalyst and released to the homogeneous phase and propagate reactions there. There is some evidence for the reaction, and if it occurs under typical conditions for hydrocarbon oxidation, it could have a marked effect on optimum design and performance of catalytic reactors for oxidation of air pollutants. The oxidation of 700 to 1400 ppm 1-hexene in air at 1 atm on one to three platinum gauzes in series was studied in a 1.05 in. I.D. aluminum flow reactor. The homogeneous oxidation of hexene was also studied by inserting a 520 cc Pyrex glass reactor in the apparatus upstream of the catalytic reactor. Air-flow rates were varied from 100 to 600 cc/sec(STP). At the high-temperature level (above 450 C), the homogeneous oxidation was first-order in hexene with an activation energy of about 60 kcal/mole. Significant quantities of by-products (incompletely oxidized products of hexene) were formed by the homogeneous reaction at high temperatures, but were not chemically identified. The catalytic life of the platinum gauze was usually less than 5 hours. The deactivation was believed to be caused by the diffusion to the surface of metal impurities in the platinum gauze. The catalyst could be reactivated by prolonged pickling in hydrochloric acid. The heterogeneous oxidation of hexene on active platinum gauze was characterized by the ignition of the reaction at approximately 350 C. The existence of a hetero-homogeneous reaction during the catalytic oxidation of hexene, if present, was beyond the detectability of the experimental technique. The catalytic oxidation of either 1-hexene or toluene on platinum gauze occurs by a mass transfer controlled reaction above approximately 350 C. Comparison of the rates observed with those predicted for mass transfer to woven wire geometries gave no evidence of hetero-homogeneous processes. The homogeneous and heterogeneous combustion of hexene, when carried out simultaneously, occur by independent mechanism, the total reaction rate being the sum of the two. Significant by-products or intermediates produced during the homogeneous oxidation may be more difficult to catalytically oxidize than the hexene.

59667

APTIC NO. 43072

METHOD OF ADSORPTION BY ACTIVE CARBON. (Kasseitan kyuchakuho). p. 66-96, 1970 (?). Translated from Japanese. Scientific Translation Service, Santa Barbara, Calif., 30p.

An active carbon adsorption method and an active manganese oxide absorption method for sulfur dioxide-containing flue gases are described. The active carbon adsorption method is aimed at removing the sulfur from large quantities of combustion gases containing dilute SO₂. A high desulfurization rate is obtained, and extraction and reclaiming are simple. The exhaust gas temperature is greater than 100 C; therefore, the diffusion properties of the exhaust are not impaired. Part of the boiler exhaust gas heat is sufficient to dry the moist active carbon after rinsing. The mist is completely removed in the adsorption unit. The by-product is dilute sulfuric acid, which can also be recovered as sulfuric acid, ammonium sulfate, or gypsum. In the case of boiler exhaust gas, the flue gas which has left the air pre-heater can be processed in an unmodified state; therefore, there is no need for changing the boiler construction. Construction costs and the economics of the method are given. The active manganese oxide method was developed for the exhaust gas from large, oil-firing thermal power plants. Since it uses active manganese as the absorbent, it has a high SO₂ absorption ratio. The manganese sulfate produced by the reaction with SO₂ is chemically regenerated in the liquid phase. Therefore, a high reactivity is maintained. No packing material is needed, and there is little pressure loss of the exhaust gas. The absorbent can be collected by cyclones or an electric dust collector. The regeneration process is of the wet type, but there is little drop in gas temperature because of evaporation of the adhering moisture; the exhaust gas temperature is maintained above 110 C. Consequently, the diffusion of the exhaust gas is not impaired. Construction costs and economics are given.

1969

59668

APTIC NO. 42468

Burdock, J. L.

PRESENT APPLICATION OF MECHANICAL COLLECTORS TO BOILERS. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1969. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 62nd, New York, June 22-26, 1969.)

Analysis of the size distribution of the fly ash is a necessity in the selection of the proper mechanical collector for particulates from fossil fuel from coal and oil generation of power or process steam. Mechanical collectors are highly efficient for the removal of particulates in the 10 to 40 micron range. Electrical precipitators are better suited for pulverized fuel in which the fly ash commonly averages 44% less than 10 micron. Ash reinjection also results in production of fine fly ash and mechanical collectors are unsuitable in many such processes. Stoker firing usually produces coarser ash suitable for mechanical collection. Selection must take into account projected future air codes, guidance from boiler manufacturers, and performance guarantees based on fly ash analysis.

59669

APTIC NO. 34819

Casanova, Jean

A PROCESS FOR THE ELIMINATION OF NITRIC OXIDE FROM INDUSTRIAL GASES. (Procédé permettant d'éliminer l'oxyde nitrique des gaz industriels). Text in French. (Uhde (Friedrich) G.m.b.H. (West Germany)) French Pat. Appl. 2,003,654. 3p., March 10, 1969. (claims not given).

The process described purifies industrial gases containing nitric oxide to a residual NO content of 0.04 cu cm/N cu m by a modification of a German process which oxidizes NO to NO₂ in an oxidation chamber and subsequently washes the gas

in a scrubber. The sudden cooling prevents the establishment of an equilibrium between NO, O₂, and NO₂. The original process purifies the gas to an NO content of 0.4 cu m/N cu m. The modification passes the gas from the oxidation chamber into an absorber where the NO₂-bearing gas is contacted with an absorbent liquid in the form of a lye solution having a pH exceeding 7.4. Oxidation and absorption take place in two separate vessels. If water is used as the absorbent, NO₂ reacts with it and yields nitric acid and NO which are not absorbed. If an alkaline solution is used as the absorbent a nitrate forms, the remaining NO reacts with NO₂, yielding N₂O₃ which reacts with the alkali to yield a nitrite. In practice, the pH of the absorbent solution should be kept between 7.5 and 8. If a derivative of imidazole is added to the absorbent solution, the residual NO content is further reduced to 0.01 cu cm/N cu m.

59670

APTIC NO. 23238

Cerny, F.

AIR POLLUTION PROBLEMS IN CZECHOSLOVAKIA.

Phil. Trans. Roy. Soc. London, Ser. A, 265(1161):261-267, Nov. 13, 1969. 12 refs.

Because of the rapid demand for electric power and limited fuel resources, most new power stations in Czechoslovakia will have to use inferior lignite fuels with a high sulfur and ash content, thus creating an urgent need for development of air pollution control measures. A 110-MW flue gas desulfurization unit, employing the non-cyclic ammonia process, was designed by research groups and is scheduled for completion in 1971. Theoretical and economic aspects of this and other gas desulfurization processes are discussed briefly. Continuing programs are underway to measure background sulfur dioxide and dust levels by lead peroxide candle and other methods in the regions where new power plants will be built. A program to measure dust content by concentrographs is being prepared. Surface burning in open coal pits has been stopped and chimney heights of old stations are being increased. General results are summarized of a series of field studies conducted in the last decade to measure plume spread from power stations in flat terrain. On the basis of these results, a technical report was issued in 1968 on methods for calculating ground level pollution caused by emissions from steam plants and other combustion processes. In addition, long-term measurements have been started to study plume behavior in hilly terrain, and tracer experiments using Freon are planned.

59671

APTIC NO. 35721

Lee, G. K., F. D. Friedrich, and E. R. Mitchell

CONTROL OF SO₃ IN LOW-PRESSURE HEATING BOILERS BY AN ADDITIVE. *J. Inst. Fuel, 42(327):67-74, Feb. 1969. 12 refs.*

Residual fuel oil containing 2.5% sulfur was burned under conditions prevalent in heating boilers to assess the effect of boiler load, excess combustion air, mean residence time, and the use of a magnesia-alumina fuel-oil additive on the formation of noxious and corrosive combustion products. The results show that the additive can be used as an effective substitute for low excess combustion air in reducing the emission of nitrogen oxides and sulfur trioxide. Furthermore, the additive neutralizes condensed sulfuric acid and improves the electrical resistivity of soot particles to the point where electrostatic precipitation of soot is technically feasible. By neutralizing acid and acid soot, the additive successfully controls low-temperature corrosion of heat exchange surfaces. In low-pressure steam boilers, the deposition of acid soot on furnace walls still result in relatively low SO₃ and RBU readings in flue gas farther downstream. Therefore, any assessment of corrosion potential in such equipment must be analyzed with respect to both furnace and combustion conditions. (Author abstract modified)

262

1968

59672

APTIC NO. 34824

Barber, J. C.

AIR POLLUTION. THE COST OF POLLUTION CONTROL. *Chem. Eng. Progr., 64(9):78-82, Sept. 1968. 6 refs.*

Problems of waste discharge and related control measures at phosphorus and phosphoric acid plants are described. The handling and processing of elemental phosphorus requires special techniques and equipment to avoid fume emission. The fumes discharged from tapping operations are sufficient to cause environmental problems unless their emission is controlled. The P₂O₅ fume consists of particles about 0.1 micron in size and is therefore difficult to collect and recover. The gases from a phosphorus furnace consist mainly of a mixture of carbon monoxide, phosphorus vapor, and hydrogen. They also contain suspended particles carried over from the furnace. Electrostatic precipitators are provided to remove dust particles and clean the gases, but handling and use of the collected dust is difficult. Dust is now handled as a slurry, which is pumped to settling ponds where settled wet solids are mixed with the incoming phosphorus feed. Furnace gases are cooled by spraying with water in a condenser. Phosphorus collected in the bottom of the sump forms sludge which is centrifuged to recover phosphorus values; the residues are burned with by-product carbon monoxide to produce phosphoric acid.

59673

APTIC NO. 79815

Ganz, S. N., I. E. Kuznetsov, P. N. Belyaev, I. I. Kupchinskii, and F. F. Povetkin

REMOVAL OF NITROGEN OXIDES FROM EXHAUST GASES. *Khim. Tekhnol., no. 14:79-85, 1968. Translated from Russian, 11p.*

A method of purifying gases from nitrogen oxides was developed and realized on an industrial scale. It includes a gas preparation and stabilization system which reduces gases to a certain pressure, temperature, concentration, and degree of oxidation of the nitrogen oxides and maintains these values at the specified level. It also contains a purification system which ensures removal of the nitrogen oxides from the emitted gases to the prescribed level. An automatic control and process regulation system allows automatic regulation of the gas preparation and purification and involves two stages of purification. Pressure relays are used to control the gas flow. Sprayers and an absorber are used in the system. Investigations on the purification of exhaust gases from nitrogen oxides were carried out under laboratory conditions and subsequently on an industrial installation. A residence time of 0.1 sec at 240 to 300 C was sufficient for complete decomposition of the ammonium nitrite-nitrate aerosol formed in the absorption of nitrogen oxides in aqueous ammonia. The construction of a new type of absorber was tested, with an upper nozzle system and a lower mechanical dispersion device for the working solutions. The degree of purification is 99 to 100% with a gas space velocity of 350 cu m/cu m hr at 25 to 30 C, with absorbing solution concentrations of 2 to 10% sodium hydroxide and 0.5 to 5.0% ammonium hydroxide, and 10 to 14% nitrogen oxides in the starting gas, the nitrogen oxides being below 0.005 vol% in the emitted gas. (Author abstract modified)

59674

APTIC NO. 83450

Jarco, Petr, Stefan Majercak, Vaclav Maly, and Anna Majercakova

PELLETIZATION OF CONVERTER DUST IN EAST SLOVAKIAN STEELMILLS. (*Pelletizacia konvertoroveho prachu vo Vychodoslovenskych zelezniaroch*). *Text in Czech. Hutnicke Listy (Prague), 23(10):679-684, Oct. 1968. 8 refs.*

The possibility of developing new methods for utilizing oxygen converter dust in East Slovakian steelmills was explored, since existing methods (returning the dust to the furnace in bags, injection of the dust into the steel bath) were unsatisfactory.

CONTROL METHODS

59681

Two basic alternatives for dust processing are proposed, both of them based on a common technology of crude pellet processing. This processing ensures a pellet strength sufficient for direct addition either to the converter or to a sintering charge, although the latter should be considered a reserve solution, since it is not really advantageous.

1967

59675

APTIC NO. 35722

Doxey, G., G. E. Hodgkinson, and G. Woodhouse

NOTE: SOME USES OF CALCIUM CHLORIDE AS AN ADDITIVE TO BOILER COALS. *J. Inst. Fuel*, 40(322):521-535, Nov. 1967. 11 refs.

The addition of 0.5% by weight calcium chloride to coal prevented freezing of the coal even at 22 °F. There was no evidence of increased corrosion of chutes, hoppers, or coal wagons. Similarly, CaCl₂ in concentrations up to 0.25% by weight had no serious effect on the rate of fouling or corrosion of boilers. Concentrations as low as 0.01% by weight had a beneficial effect on fireside boiler deposits, making them softer, more friable, and easier to remove. The addition of 0.2-0.3% by weight CaCl₂ to coals fired on stokers reduced grit emissions by 25-45%. Dust emissions also appeared to be reduced by the addition of CaCl₂ to coal fed to a pulverized-fuel boiler equipped with an electrostatic precipitator. (Author conclusions modified)

59676

APTIC NO. 67136

English, M.

FLUORINE RECOVERY FROM PHOSPHATIC FERTILIZER MANUFACTURE. *Chem. Process Eng.*, vol. 48:43-47, Dec. 1967. 12 refs.

The present demand for fluorine is expanding so rapidly that the traditional sources -- natural cryolite and fluor spar -- may soon be exhausted. An alternative source is fluorapatite, containing 3.5% fluorine, used principally for the production of superphosphate and phosphoric acid for fertilizers by the wet process. A process is described for using the by-product from the process, fluorosilicic acid, which is generally discarded, in the commercial production of fluorosilicates, cryolites, and fluorides. The fluorosilicic acid is produced during production of superphosphate and phosphoric acid when fluorine compounds in the stack gas are absorbed in a countercurrent scrubber. (Author abstract modified)

59677

APTIC NO. 42469

Mortstedt, S. -E.

TEST REPORT ON AUTOMOBILES EQUIPPED WITH REACTOR PLATES IN THE CYLINDERS. (*Provningsrapport beträffande reaktorplatta i cylinder*). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-10, 2p., June 27, 1967.

Exhaust emission measurements on an engine equipped with reactor plates in its cylinders were planned, but not performed as preliminary drivability test revealed that the car equipped with the above reactor plates was not drivable. After the engine was run up over a distance of about 2 km, ignitions due to incandescence occurred, the cooling water began boiling and the engine stopped.

59678

APTIC NO. 42472

Mortstedt, S. -E.

TEST REPORT ON AUTOMOBILES EQUIPPED WITH SANDS TYPE GAS MIXER. (*Provningsrapport beträffande Sands Gasmixer*). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-8, BA-SSL-250, 9p., April 27, 1967.

Results of exhaust measurements carried out on automobiles equipped with Sands type gas mixer are presented. The gas mixer is designed to admit a certain amount of secondary air

to the fuel-air mixture before or after the carburetor throttle, where the air is possibly passed through a special liquid. The USA-tests performed according to the California cycle on cars equipped with two different designs of the above gas mixer, filled or not with special liquid and water, showed no significant reduction in the carbon monoxide and hydrocarbon emissions. In addition, both the drivability, acceleration, and engine output were deteriorated by the gas mixer which is thus inferior to proper carburetor adjustment.

59679

APTIC NO. 42473

Mortstedt, S. -E.

TEST REPORT ON NOCO REACTOR. (*Provningsrapport beträffande NOCO- reaktor*). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-6, BA-SSL-247, 7p., Feb. 14, 1967.

Carbon monoxide and hydrocarbon emission measurements were carried out on an 1963 model Opel Kadett where the exhaust system was replaced by a newly invented NOCO reactor. An air-fuel ratio of about 17 was adjusted for idling to reach a CO content of 0.1%. While it was not possible to perform the complete California test, five run-up cycles and two hot cycles were applied, and measurements after two or four hot cycles were made in another test. The mean values obtained for CO and hydrocarbons during hot cycles were 1.06-2.02% and 467-623 ppm, respectively. The hydrocarbon concentration of 623 ppm was obtained from measurements performed under conditions specified by the inventor. The NOCO reactor supplied excess air at low speeds. The excess air, amounting to 25% at idle to decrease to zero at 50 km/h, had unfavorable effect on the total CO and hydrocarbon emission.

59680

APTIC NO. 20006

Wendt, C. J., Jr. and L. W. Dailey

GAS TREATING: THE SNPA PROCESS. *Hydrocarbon Process*, 46(10):155-157, Oct. 1967. 2 refs. (Presented to the Canadian Natural Gas Processing Association, Edmonton, Alberta, June 2, 1967.)

The SNPA-DEA (Societe Nationale des Petroles d'Aquitaine - diethanolamine) gas treating process available to the natural gas industry for attaining hydrogen sulfide pipe line specification gas, is discussed. The flow scheme is explained and typical results related to treated gas purity, acid gas purity, power requirements, DEA solution losses, and corrosion problems are reported. Such units are able to meet pipe-line hydrogen sulfide specifications at low process circulation rates. Compared to monoethanolamine units, this scheme requires smaller major equipment with significantly reduced utility consumption and solution losses. A 20- to 30-weight percent DEA solution is used; solution circulation is set from 1.0 to 1.3 moles of DEA per mole of acid gas. The raw gas stream is contacted countercurrently with lean DEA solution in an absorber where the acid gases are removed.

59681

APTIC NO. 82178

STUDIES ON ANTI-SMOKE DERIVATIVES. (*Etude sur les additifs anti-fumes*). Text in French. Lab. Munic., Prefect. Police Paris no. 56.275 D/PA Part III:1-4, April 1967.

The presence of one or the other of two additives definitely decreases the level of smoke emission in diesel engines. The decrease is more noticeable when the quantity of the additive in the fuel is high. The addition of these compositions appears to have no effect on the emission of other pollutants such as carbon monoxide, aldehydes, nitrogen oxides, and oxidants. The barium present in the additives appears in a soluble form in the exhausts at levels varying with the amount of additive employed: 1.5 to 3.0 ppm barium/cu m for 0.5% additive and 0.6 to 1.5 mg/cu m at lower levels of additive. Considering the natural dilution of automotive exhausts, the level of soluble barium in the atmosphere will be practically negligible in the streets, and only slightly noticeable in garages, and in any case

will occur in levels below that recommended by American occupational standards. (Author abstract)

1966

59682

APTIC NO. 42539

Bolt, Jay A.

FUTURE AUTOMOTIVE POWER PLANTS-AND AIR POLLUTION. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 85-101. 23 refs. (Dec. 12-14.)*

Powerplants for vehicle use, present and future, and the possibilities of reducing their emissions are reviewed. The present types of piston engines will continue for many years to be the main source of power for highway transportation. Major reductions in exhaust emissions will continue under the impetus of regulations. Battery powered vehicles may find some use for small vehicles and short range applications. Reduced air pollution must come from improvements made on present engines. The fuel cell may be more important in the distant future. Any successful program for reduction of exhaust emissions from vehicles must include an effective engine inspection and maintenance program. Energy sources and conversion systems, emissions from gasoline engines, reduction of emissions through engine design modification and exhaust systems devices, and the respective merits of the stratified charge spark-ignited engine, the diesel engine, gas turbine engines, the rotary engine, electric vehicles, and fuel cells are examined. (Author abstract modified)

59683

APTIC NO. 42554

Grant, Eric P.

STATUS REPORT: MOTOR VEHICLES. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 42-44. (Dec. 12-14.)*

During the last six years, the motor vehicle has come to be recognized as a major source of atmospheric pollutants. Emissions from motor vehicles are significant factors in any consideration of the national air pollution problem. Studies verify that an uncontrolled vehicle wastes one gallon of every 10 in the gas tank. Nationwide, seven billion gallons of gasoline each year are lost. In California there are crankcase control devices on 6.5 million vehicles and exhaust control devices on more than a million vehicles. These controls prevent nearly half a million gallons of raw gasoline from escaping into the air every day. In relation to the nonequipped vehicle of the 1950 s, the 1970 model vehicle will be a vastly different automobile. The motoring public will save upwards of two-thirds of a billion dollars in fuel costs each year. The initial cost of the control system will be significantly reduced. At present, air pollution costs the American people \$11 billion/yr.

59684

APTIC NO. 42593

Rehm, Fred R.

DISCUSSION: CONTROL OF AIR POLLUTION FROM MUNICIPAL INCINERATORS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 327-331. 10 refs. (Dec. 12-14.)*

Gas phase pollutants, including sulfur dioxide, nitrogen dioxide, carbon monoxide, hydrocarbons, and carbonyls, constitute a minor part of municipal incinerator air pollution problems. Opinions on particulate emission problems differ. Present New York incinerators use highly inefficient water spray fly-ash removal systems and should not be used as examples of the state-of-the-art. Modern well-managed incinerators discharge particulates at about the same level as fuel oil combustion. Comparisons cannot be made between European and American incinerator processes because of drastically different materials handled. Other variables than the cleaning up of flue gas may be more readily and economically improved. Process modifications, spray chambers, wet baffle collectors, scrubbers, design improvements, and abatement legislation are discussed.

AIR POLLUTION ABSTRACTS, JUNE 1976

59685

APTIC NO. 20007

Schoofs, R. J.

NATURAL GAS CLEAN UP PRIOR TO LIQUEFACTION. *Gas, 42(11):85-91, Nov. 1966. 10 refs.*

Pre-purification of feed gases prior to liquefaction using molecular sieves is discussed; the advantages of this approach over liquid absorption are stressed. Removal of water, acid gases, sulfur compounds, and oil vapor is mentioned. The fact that acid gases are returned to the pipeline rather than vented to the atmosphere is pointed up as a pollution-control factor. Comparative characteristics are given for the adsorptive characteristics of molecular sieves and common adsorbent as silica gel and activated alumina.

59686

APTIC NO. 42564

Seaborg, Glenn T.

DEVELOPMENT OF NATIONAL POLICY WITH RESPECT TO NUCLEAR AND OTHER NEW SOURCES OF POWER. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 131-136. (Dec. 12-14.)*

The main advantage of nuclear power plants is their lack of chemical combustion products as waste. The minute amount of radioactivity produced auxiliary to the process can be held and released in tiny amounts and under favorably chosen atmospheric conditions with no health hazard. The safety and economy inherent in nuclear reactor technology are the primary cause for the growth of nuclear power. Light water reactors are the mainstay of nuclear power generation today. Future development of reactors of the advanced convertor design, near breeder reactors, and breeder reactors should eliminate the dependency of the industry on short supply uranium-235. High gain breeder reactors will probably be available by 1990 and should provide an unlimited supply of power. A national policy should be undertaken to restructure all industry around the atomic power plant. The use of solar energy and controlled thermonuclear fusion lie further in the future. Solar energy may never be applicable except as a small, localized phenomenon. Four Atomic Energy Commission laboratories and two private laboratories are now developing the controlled fusion reactor. The use of magnetohydrodynamic conversion, where high velocity electrically conducting gases eliminate the need for turbogenerators, will also have a significant effect on the cost structure of the powder industry. The combined use of thermonuclear heat and MHD technology might produce spectacular results.

59687

APTIC NO. 42523

Wessenauer, G. O.

HEAT AND POWER GENERATION. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 604-606. (Dec. 12-14.)*

The control of fly ash, sulfur oxides, and nitrogen oxides within the electric power industry is reviewed. The technology for fly ash removal is available now. By application of present technology, the fly ash emission to the atmosphere is expected to decline between now and 1980 from 6.5 to about 3.8 million T/yr. Removal of sulfur oxides is a more difficult matter. Efforts have been directed toward the use of low sulfur fuels and to the extraction of sulfur from the fuel before burning, as well as to removal from the effluent gases. For the immediate future, increased application of methods presently available and the development of the most promising processes is needed. Research into the reduction of nitrogen oxides is limited. There is a need for better definition of the ambient levels of nitrogen oxides permissible. Research should consider the temperature of formation and the use of surface catalysts. Ground level pollution is at the present time effectively controlled by the use of high stacks. More reliable methods of prediction of plume behavior under a variety of meteorological conditions are also needed.

59688

APTIC NO. 42563

White, Lee C.

DEVELOPMENT OF NATIONAL POLICY WITH RESPECT TO NATURAL GAS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 137-142. (Dec. 12-14.)*

The substitution of natural gas for other fuels clearly has a place in the overall program of pollution control, but it cannot bear the major burden of the effort. Conservation of gas resources argues against the wholesale replacement of other fuels. Perhaps the dollars involved could buy still cleaner air if they were devoted to other air pollution controls. The cost-benefit approach to natural gas utilization should consider its availability as a resource. The problem must be evaluated in terms of extra fuel costs/benefit as well as in terms of the cost of alternatives in fulfilling the same goals.

59689

APTIC NO. 21477

CHEMICAL BLANKET GUARDS LNG PLANT. *Am. Gas Assoc. Monthly, 48(6):8-10, 18, June 1966.*

A fire extinguishing system with a capacity of 30,000 pounds of dry chemical and 40,000 gallons of water is described. The system protects an in-ground liquefied natural gas storage tank with a capacity of 300,000 barrels of LNG. The system is capable of delivering all 30,000 pounds of its sodium bicarbonate base dry chemical onto and into the tank in one minute. Double redundancy is incorporated into the activation systems permitting activation automatically, by manual-electric means, and manually in a power-down situation. The extent of protection is required both by reason of the volume of gas involved and by its location at Carlstadt, New Jersey, only half-a-dozen miles from midtown New York City.

1965

59690

APTIC NO. 82345

Coster, Jean-Paul de

TESTS TO REDUCE AIR POLLUTION BY GASOLINE MOTORS USING OZONE. (*Essai de reduction de la pollution de l'air par les moteurs a essence au moyen d'ozone*). Text in French. *Aspects Tech. Securite Routiere Brussels, vol. 1965:1-10, 1965.*

An apparatus is described for the introduction of ozone into the fuel intake or into the exhaust of a gasoline engine in order to reduce toxicity of the exhaust fumes. Test results show that introduction of O₃ into the intake is not effective or only slightly so; its chief effect is to raise combustion temperatures, and by disturbing the richness of the combustion mixture, to increase the carbon monoxide level. The introduction of O₃ into the exhaust was tested with several variables, with contradictory conclusions. To permit the exhaust to cool, the apparatus should be placed as far as possible from the engine. To permit the development of post combustion, the apparatus should be placed upstream on the exhaust pipe. Since the decrease in CO never exceeded 25%, the test results do not justify continuation of further study. (Author abstract)

59691

APTIC NO. 82346

Thiebault, R.

AN INTERESTING EXPERIENCE WITH THE REDUCTION OF CARBON MONOXIDE LEVEL EMITTED BY GASOLINE ENGINES, CONDUCTED BY THE AUTOMOBILE GARAGE OF THE PREFECTURE OF POLICE IN PARIS. (*Une experience interessante de reduction du taux d'oxyde de carbone emis par les moteurs a essence menee sur le parc automobile de la prefecture de police parisienne*). Text in French. *Aspects Tech. Securite Routiere Brussels, no. 23:1-11, Sept. 1965.*

In order to reduce air pollution from automotive exhausts, carburetors were systematically set to minimum CO emission at

idle and deceleration, (phases which account for most of the CO emission). No vehicles emitted more than 2.5% CO, whereas previously about 72% of the cars had emitted over 3% CO. This was verified by use of a gas analyzer or an explosimeter. As a result, air pollution was decreased in a parking garage, even in the absence of any ventilation. The implications of this method for air pollution control in large cities are discussed. (Author abstract)

59692

APTIC NO. 83448

Zimmer, K. O.

RAPID OPEN-HEARTH STEELMAKING, CHARGING LOW-PHOSPHORUS HOT METAL AND REFINING WITH OXYGEN. (*Schnellverfahren zur Erzeugung von SM-Stahl durch Einsatz von fluessigem, phosphorarmem Roheisen und Frischen mit Sauerstoff*). Text in German. *Radex Rundschau (Austria), no. 1:369-377, 1965. 7 refs.*

A high-productivity steelmaking process with low-phosphorus liquid pig iron and refining with oxygen (Dillingen method) is described. The charge contains 40% hot metal, with the balance being scrap. Brown smoke appears as soon as oxygen blow is initiated. The flue gases, whose temperature is lowered to below 250 C through a waste heat boiler, are cleaned in an electrostatic precipitator developed by LURGI. It is thus possible to reduce the dust content of the flue gases from up to 12 g/N cu m to below 100 mg/cu m. The specific cost of dust separation amounts to about \$.33/ton of steel.

1962

59693

APTIC NO. 83453

Gerlach, Johannes, Franz Pawlek, and Wolfgang Wuth

REMOVAL OF ZINC FROM BLAST-FURNACE FLUE DUST. (*Beitrag zur Entzinkung von Hochofengichtstaub*). Text in German. *Stahl Eisen (Duesseldorf), 82(26):1855-1857, 1962. 6 refs.*

A method for the removal of zinc from blast-furnace flue dust is described. Flue dust containing 15.3% iron, 9.5% zinc, 8.6% carbon and 0.5% lead was pelletized with 10-15% carbon, after which zinc oxide was reduced to metallic zinc and removed by evaporation in a short-drum rotary furnace. Practically 100% zinc removal was achieved at temperatures over 1000 C (1050 C). With the zinc removed, the pellets could be recycled within the blast-furnace process. Lead evaporated in the form of lead sulfide or remained in the pellets as metallic lead.

59694

APTIC NO. 24160

Maeda, Seiichiro, Hiromi Hasegawa, and Hiroya Watanabe

A NEW METHOD OF TREATMENT OF SULFUR DIOXIDE ABSORBING SOLUTION. (*Aryusangasu kyushueki no shori hoho*). Text in Japanese. (*Steel Manufacturing Chemical Industries (Japan)*) Japan. Pat. Sho 37-9451. 3p., July 27, 1962. (Appl. Sept. 3, 1960, claims not given).

The dilute sulfur dioxide discharged from sulfuric acid plants or ore refineries is removed by absorption in ammonium sulfite solution. The concentrated solution of sulfur dioxide thus formed is added to sulfuric acid and regenerated. In this process of recovering sulfur dioxide, ammonium sulfate is also recovered. Normally, minute amounts of ammonium thiosulfate and ammonium polythionite are contained in the solution, causing corrosion of the container. The present invention is concerned with abating the corrosion. After establishing that corrosion was primarily caused by the two ammonium salts, it was found that the rate of decomposition of the salts was a function of acid concentration, temperature, and time. The decomposition is a one-molecular reaction that decreases corrosion when these three factors are satisfied. Container corrosion was almost completely negligible when an ammonium sulfite-SO₂ solution was heated with excess sulfuric acid, so the potassium dichromate consumption was below 0.002 mol/l. In a sulfuric acid manufacturing factory, the sulfur dioxide absorbing solution contained 7-9% ammonia

and 25-33% free sulfuric acid. The result of a corrosion test showed 10u15 g/sq m/hr. When the solution was kept at 90 C for 3 hours and at an acid concentration of 10 N, ammonium thiosulfate and ammonium polythionite were reduced below 0.0004 mol/l in terms of potassium dichromate consumption. As a result, corrosion was reduced to 1.2-1.5 g/sq m/hr, which was negligible.

1961

59695

APTIC NO. 42492

Mauss, F. and H. Djavanmard

COBALT-BASE ADDITIVES REDUCE SOOT EMISSION BY OIL-BURNING EQUIPMENT. *Cobalt*, vol. 11:21-27, June 1961. 4 refs.

Test are described which show that the addition of organic compounds of cobalt to fuel oils decreases the weight of the combustion residues, independent of the operating conditions of the boiler. As a result, for a given weight of residue, the cobalt additives allow the amount of excess air to be lowered, and consequently reduce the waste heat. On the other hand, their use scarcely changes the rate of fouling of exchanger surfaces in ordinary domestic boilers, and the increase in efficiency which could have been hoped for in this direction is insignificant. It was verified that cobalt additives do not catalyze the oxidation of sulfur dioxide to sulfur trioxide, and that their use therefore presents no risk of increasing the corrosion of heating equipment. (Author conclusions modified)

59696

APTIC NO. 83452

Wolf, Wilhelm and Helmut Wysocki

OPERATING DATA ON THE BRIQUETTING OF (BLAST-FURNACE) FLUE DUST. (*Betriebsergebnisse beim Brikettieren von Gichtstaub*). Text in German. *Stahl Eisen* (Duesseldorf), 81(9):559-561, 1961.

Flue dust from the dust pockets and heavy-duty centrifugal dust separators of blast furnaces at Westfalenhuette, West Germany, is pressed to pillow-shaped briquettes, using sulfite black liquor as a binding agent. The briquettes are returned to the blast furnace together with the roasted charge. The briquettes contain 30% iron, 1% phosphorus, 8-9% silica, 13% calcia, 10-12% carbon, and 0.7% sulfur. The use of up to 25% briquettes in the charge caused a negligible increase in the sulfur dioxide concentration in the throat gases from 14 to 19 mg/N cu m.

1960

59697

APTIC NO. 40803

Doerschuk, V. C.

HOW TO CONTROL EMISSIONS FROM ELECTRIC STEEL MELTING FURNACES. PART II. *Air Eng.*, 2(10):42-47, Oct. 1960. 13 refs.

Control methods to prevent emissions of particulate oxides with metallics, smoke, carbon dioxide, and atmospheric gases from electric steel melting furnaces are examined, and source and composition of emissions, dust loading, collection efficiency, dust disposal, cfm requirements, and detailed cost data are reviewed. For the most part, the hood with various modifications or the roof-tap method work as well as emission collectors. Whether to cool emissions by air, water, or both, can best be determined by the overall system economics. The emissions, mostly dust, can be cleaned by bags, by Cottrell, by water wash tower and wet disintegrator. Some of the modern improved wet washers may prove satisfactory, provided they remove the fines in accordance with requirements. A cleaner should be used which will show little visible discharge, and since the emissions are very fine the discharge should be below 0.05 g/cu ft. Not much data is available on operating costs of control systems. One plant with 2 furnaces making 145,000 tons/year of alloy steel gives \$1.26 per ton. Ef-

AIR POLLUTION ABSTRACTS, JUNE 1976

fort should be made to stop furnace leaks thus reducing secondary air required to remove the emissions. To get cost information operators of present systems should be consulted, and estimates of costs should be obtained from suppliers who have already built similar installations. (Author conclusions modified)

59698

APTIC NO. 36986

Marnet, Hermann and E. P. Street

MERCK SHARP AND DOHME S INCINERATOR PLANT DESIGNED TO MEET TODAY S WASTE DISPOSAL PROBLEMS. *Plant Maint. Eng.*, 22(2):34-36, Aug. 1960.

An incinerator with a mechanical stoker and rotating grates burns up to 3000 lb/hr of pharmaceutical-plant non-liquid wastes at 1800-2000 F without producing smoke or odors. The waste mixture includes animal wastes; paper, cardboard, and plastic rubbish; eggs and other wet process wastes; and glassware. The incinerator consists of a furnace chamber with the stoker, a combustion chamber, and a secondary chamber. The latter is equipped with water sprays for cooling flue gases and settling fly ash. Ashes collecting at the lower end of the stoker are disposed of in a land-fill operation. An added feature of the incinerator is a steam atomizer burner in the furnace chamber for burning waste solvents.

59699

APTIC NO. 34743

Nickerson, Robert D.

SLUDGE DRYING AND INCINERATION. *J. Water Pollution Control Federation*, 32(1):90-98, 1960. 4 refs. (Presented at the New York Sewage and Industrial Wastes Association, Annual Meeting, 31st, New York, Jan. 22-23, 1959.)

Cost data on sludge disposal in three sewage treatment plants and information on air pollution (deodorization and fly ash collection) and sludge utilization, are presented. The two principal control measures associated with heat treatment of sludge are deodorization of effluent gases and fly ash collection. A heat exchanger is an economic necessity when drying sludge if the gases must be deodorized. A tubular heat exchanger is now in use in many plants. The most widely used and accepted equipment for collecting fly ash is the high-efficiency centrifugal dust collector, usually consisting of a large number of small-diameter cyclones which give high efficiencies even on finer dusts. The use of water scrubbers for removing particulate matter from the vent gases of sludge disposal systems is sometimes attractive. Stack dispersion of combustion gases is generally accepted; the stack height selected should take into account the topography of the site, wind direction, quantity of vent gases, developed areas, future land use, and even the shape of the sewage treatment plant buildings.

1959

59700

APTIC NO. 43049

Bernhardt, A. A. and J. S. Buchanan

RECOVERY OF DISSOLVER VENT STACK SODA LOSSES. *TAPPI*, 43(6):191 A-193 A, June 1960. 1 ref. (Presented at the Technical Association of the Pulp and Paper Industry, Alkaline Pulping Conference, 13th, Jacksonville, Fla., Nov. 4-6, 1959.)

A 350-ton smelt shatter recovery unit which uses steam shatter nozzles directed downward at the smelt stream was installed in a Nekoosa kraft mill in 1955. Chemical losses from the dissolver stack were determined by a pitot tube transverse of the stack, measurement of wet and dry bulb temperature, and barometric and stack pressures. Tests disclosed that alkali losses, though not an air pollution problem, averaged 4020 lbs/day as sodium sulfate or 17.1 lbs/ton of pulp produced, having a value of \$68.90/day. For reducing losses, heat and chemical recovery systems as well as various types of scrubbers were considered. Data on the design of a knitted-metal mist eliminator installation was furnished by the Metal Textile

CONTROL METHODS

59704

Corporation who affirmed that a properly fitted mist eliminator could be expected to recover 99% of the droplets over 5 micron in diameter. A unit costing \$2600 was completed and put in service in 1958 with immediate results of reducing the dissolver vent stack loss by 16.3 lbs of salt cake/ton of pulp produced. Increasing the by-pass damper by about 2 in. resulted, with subsequent tests indicating a dissolver vent stack loss of approximately 0.5 lbs of sodium sulfate/ton of pulp. After eight months, the mist eliminator was found to be seriously plugged with 88% calcium carbonate material on top and undissolved smelt on the underside of the mesh. To rectify this problem, combined condensate water from the vacuum evaporators for the mist eliminator shower instead of fresh water was planned.

1958

59701

APTIC NO. 52011

Daniel, Lawrence Richard, Jr.

EFFECT OF FUEL-IMPINGEMENT-SURFACE TEMPERATURE ON NOISE, SMOKE, AND POWER OF A COMPRESSION-IGNITION ENGINE. *Michigan State Univ., East Lansing, Dept. of Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1958, 129p. 29 refs.*

The objective of this study was to investigate the effect of impingement-surface temperature on smoke, noise, and power in a fuel-impingement compression-ignition engine (diesel engine) combustion system. A fuel-impingement system for a compression-ignition engine was successfully constructed and tested. Spherodization of the fuel spray at high surface temperatures was investigated. The engine did not operate in a sufficiently high temperature range for which spherodization would seem likely. Deposit formation caused more trouble as the temperature of the impingement surface was increased. The distance between the injector nozzle and the impingement surface was somewhat critical in that too small a distance would allow diversion of the fuel spray by the deposits prior to its complete spreading on the lip, while too large a distance would allow a large portion of the fuel to autoignite and cause a louder combustion noise. The beneficial effect of an impingement surface on noise and smoke increased as the surface temperature increased. At the higher surface temperatures, however, deposits quickly formed and the beneficial effect of the surface was reduced. For this engine, the optimum surface operating temperature was in the neighborhood of 500 F. Above this temperature the smoke became worse, power dropped off, and noise tended to increase; depending on the manner in which the deposits formed. Below this temperature both noise and smoke quickly became unreasonable. The effect of compression ratio on the surface-impingement system in a compression-ignition engine such as this one was similar to that of the normal space-impingement system. For compression ratios between 16:1 and 22:1, smoke became worse, power increased, and noise decreased as the compression ratio was increased. Higher compression ratios than 22:1 gave excessive smoke. (Author abstract modified)

1957

59702

APTIC NO. 54276

Ransburg, Edwin M.

ELECTROSTATIC GAS-TREATING APPARATUS. (Ransburg Electro-Coating Corp., Indianapolis, Ind.) U. S. Pat. 2,788,081. 7p., April 9, 1957. 7 refs. (Appl. Sept. 10, 1952, 12 claims).

An improved electrostatic gas-treating apparatus for removing dust and other particles from a gas stream has been designed to offer less resistance to gas flow, thus increasing the effectiveness of the dust-charging operation. The dust-charging means consists of an open cone mounted centrally in the gas stream and maintained at a substantial potential difference

with respect to the gas duct which is grounded. A high-voltage potential is applied between the cone and the duct wall and causes a stream of ions, formed in the gas adjacent the sharp edge of the cone, to flow away from the cone and towards the duct wall. The conical dust-charging means offers less resistance to gas flow than the standard dust-charging grid of rods and fine wires. A spray-creating apparatus is located inside the duct a short distance downstream from the dust-charging means and consists of a device which atomizes the liquid from the extended edge of a thin liquid film. Rotation of a portion of the device allows the formation of the liquid into an extended film from the edge of which atomization occurs in an electrostatic field. The atomization will be effected from a number of closely spaced cups formed along the film-edge and will result in the formation of a great number of uniform, very finely atomized particles. These particles, being highly charged to approximately the same potential, will tend to disperse one from the other and will simultaneously move in the direction of the lines of force of the electrostatic field into which atomization takes place.

1955

59703

APTIC NO. 82720

Pratt, D. C. F. and A. Rutherford

REMOVAL OF HYDROGEN SULPHIDE FROM EXHAUST AIR FROM A VISCOSE STAPLE FIBRE FACTORY. *Chem. Ind. (London), 1955:1281-1286, 1955. (Presented at the Society of Chemical Industry, London Section, Symposium on the Prevention of Atmospheric and Water Pollution in the Chemical Industry, London, England, April 4-5, 1955.)*

Results from pilot tests and field experience with the use of the Ferrox process for scrubbing hydrogen sulfide from the exhaust air of a viscose staple fiber factory are reported. The Ferrox process involves the removal of H₂S from the contaminated air by scrubbing with an alkaline liquor containing a suspension of hydrated ferric oxide. The scrubbing liquor is circulated to the absorption chamber from a tank wherein the absorbed sulfide is oxidized. The tank is fitted with aerators which provide the supply of oxygen required for the oxidation while helping to maintain the catalyst in suspension. The operation of a full-scale plant for 12 mo resulted in a reduction of H₂S from about 300 ppm to 10-20 ppm.

59704

APTIC NO. 40798

Schwartz, Harry E., Leo E. Kallan, and Arnold Stein

CONTROLLING ATMOSPHERE CONTAMINANTS IN THE SMELTING AND REFINING OF COPPER-BASE ALLOYS. *Air Repair, 5(1):5-9, 26, May 1955. (Presented at the Air Pollution Control Association, Semi-Annual Technical Conference, 1st, Los Angeles, Calif., Nov. 4-6, 1954.)*

The production equipment used in a secondary smelter, the basis for selection of suitable controls, and operational and economic considerations within the smelting and refining operations of copper-base alloys are reviewed. The construction of the correct production and control units is only the beginning. The effectiveness of the equipment is directly proportional to the ability of the production staff. Collecting the dust and fumes is of paramount importance from an economic standpoint. However, the value of the captured emission product is only a fraction of its worth were it retained in the furnace. The goal of the operation is, therefore, to minimize emissions. Greatest emphasis must be given to the control of losses during the smelting and refining operation in order to achieve the lowest possible production cost. This involves proper selection and preparation of material to be charged; proper order of charging since, in many instances, high melting point scrap can be introduced into the molten bath and melted at a much lower temperature than would be necessary were it charged directly into the furnace and heated; the correct use of the correct flux at the correct time; and the exer-

267

cise of proper procedure during the tapping operation. There is no serious trouble in operating a properly designed baghouse. The common complaint of down time is eliminated by allowing sufficient capacity in the design to permit efficient filtration, even when a cell must be cut out of the system during repairs or bag replacement. The control equipment was purchased and erected at a total cost of approximately \$125,000.00, as opposed to an original investment of \$2.00-\$2.50/cfm. The recovered product is marketable at a figure relatively proportional to the current price and availability of zinc; a dust-collection exhaust system stabilizes furnace operation by controlling draft fluctuation; and plant and atmosphere cleanliness are assured. (Author conclusions modified)

1951

59705

Jones, W. P.

A VENTURI SCRUBBER FOR CLEANING INDUSTRIAL GASES. *Heat. Vent.*, 48(4):73-75, April 1951.

The industrial application of venturi scrubbers are described, and performance data and particle size information are given. The scrubbing liquid is introduced into a venturi throat. The circle of jets under low pressure (5-15 lb/sq in.) created a curtain of liquid across the throat. The gas to be cleaned collides at high velocity with the liquid curtain which is thereby violently accelerated and disrupted. The wetted particulate matter suspended in finely dispersed droplets coalesces downstream, and the resulting larger droplets of liquid are separated from the gas by a centrifugal separator. The solid-bearing liquid is diverted and piped off to a settling tank, while the cleaned gas proceeds on out the top of the separator. The operating principle is complex and consists of four mechanisms: the impingement of high-velocity gas-borne solid

particles on the relatively stationary scrubber fluid; collection of the fine particles by diffusion; condensation of wetted particulate matter in droplets; and the presence of electrostatic charge in both particles and droplets. The venturi scrubber is successfully used with black liquor recovery furnaces; open-hearth steel furnaces, reaching 99% weight efficiency in the presence of oxygen; and blast furnaces, where efficiencies are 98% or 99%. Other applications include the removal of mists and fogs from effluent gases at 97.5-99.4% efficiency, sulfuric acid, the removal of odorous substances from effluent gases, the recovery of valuable chemicals such as absorbent monoethanolamine, secondary lead smelters, wood distillation gas cleaning, phosphoric acid plants, and phosphoric acid concentrators. One of the particular advantages of the venturi scrubber is its relatively low cost and simple operation and maintenance.

1949

59706

Collier, Raymond F.

CUPOLA DUST SUPPRESSION. *Gray Iron Founder's Society, Inc., Cleveland, Ohio*, 27p., Dec. 1949.

Cupola dust is unusually fine coke particles produced during lighting off of gray iron foundry unit. Particle size is large and rapid settling usually ensues. Closed door cupolas produce 3 to 15 grains/cu ft; open door cupolas produce 0.2 to 10 grains/cu ft. Since no standard tests exist, standard tests and equipment must be produced so that reproducible results are possible. The community should pay the bill for dust suppression. Dust suppression can be improved by improved firing techniques, improved stack scrubbers, and by electrical precipitation.

APTIC NO. 43054

SUBJECT INDEX

A

ABATEMENT

58107, 58589, 59165, 59200, 59275, 59684,
59686, 59688

ABSORBERS (MATERIALS)

58366, 59245

ABSORPTION (CONTROL)

58119, 58148, 58164, 58184, 58208, 58215,
58224, 58231, 58232, 58248, 58276, 58289,
58293, 58296, 58300, 58308, 58341, 58352,
58394, 58398, 58415, 58429, 58457, 58487,
58511, 58571, 58604, 58606, 58624, 58640,
58655, 58662, 58668, 58681, 58682, 58683,
58691, 58696, 58705, 58708, 58709, 58717,
58720, 58756, 58769, 58785, 58799, 58813,
58835, 58836, 58861, 58862, 58888, 58916,
58975, 58990, 59005, 59031, 59037, 59040,
59044, 59045, 59049, 59057, 59070, 59079,
59085, 59101, 59122, 59125, 59138, 59165,
59168, 59171, 59198, 59204, 59211, 59220,
59244, 59245, 59252, 59253, 59264, 59269,
59271, 59286, 59298, 59308, 59329, 59367,
59380, 59399, 59415, 59447, 59461, 59483,
59492, 59520, 59525, 59533, 59565, 59586,
59601, 59608, 59611, 59615, 59616, 59624,
59660, 59661, 59673, 59676, 59680

ABSORPTION (GENERAL)

59337, 59348, 59361, 59481, 59486, 59565,
59599, 59609, 59610, 59622, 59633, 59644,
59659, 59662, 59694

ABSORPTION PHENOMENA

58293, 58415, 58813, 58888, 59057, 59101,
59122, 59264, 59269, 59467, 59492, 59533,
59554, 59673

ACETYLENES

59571

ACID SMUTS

58275

ACTIVATED CARBON

58168, 58209, 58369, 58386, 58413, 58461,
58643, 58646, 58647, 58685, 58699, 58766,
58780, 58856, 58867, 58888, 58989, 58994,
59093, 59101, 59106, 59254, 59298, 59313,
59319, 59396, 59493, 59539, 59613

ADSORPTION (CONTROL)

58105, 58168, 58218, 58226, 58236, 58284,
58293, 58311, 58366, 58373, 58388, 58410,
58429, 58436, 58439, 58449, 58450, 58457,
58479, 58516, 58522, 58555, 58572, 58583,
58630, 58636, 58643, 58646, 58648, 58664,
58674, 58685, 58699, 58720, 58780, 58799,
58856, 58867, 58915, 58982, 59037, 59043,
59106, 59134, 59145, 59163, 59178, 59198,
59213, 59230, 59238, 59254, 59268, 59298,
59308, 59313, 59321, 59366, 59389, 59396,
59469, 59477, 59491, 59493, 59507, 59508,
59520, 59525, 59532, 59539, 59546, 59554,
59562, 59568, 59569, 59607, 59608, 59685

ADSORPTION (GENERAL)

59416, 59507, 59630, 59667

ADSORPTION PHENOMENA

58293, 58439, 58646, 58882, 59389, 59532,
59568

AEROSOL ATOMIZATION

58724, 58810

AEROSOL FORMATION

58724, 58810

AEROSOL MECHANICS

59555

AEROSOLS

58102, 58124, 58252, 58816, 58838, 58969,
59026, 59297, 59312, 59564, 59572, 59577,
59643, 59655, 59673

AFRICA

58275, 59485, 59637

AGRICULTURAL CHEMICAL PLANTS

58165, 58190, 58244, 58343, 58438, 58589,
58656, 58662, 58946, 58952, 59035, 59037,
59087, 59141, 59198, 59295, 59399, 59524,
59526, 59611, 59617, 59665, 59672, 59676

AGRICULTURAL SERVICES

59246

AGRICULTURE INDUSTRY

58369, 58522, 59246

AIR CONDITIONING EQUIPMENT

58213, 59038, 59266

AIR POLLUTION FORECASTING

59535

AIR PREHEAT

58212, 58541, 58545, 58557, 59050

AIR QUALITY CRITERIA

58345

AIR QUALITY MEASUREMENT PROGRAMS

58315, 58664, 59056, 59489

AIR QUALITY STANDARDS

58295, 58366, 58578, 58755, 59291, 59361,
59550, 59559, 59664

AIR RESOURCE MANAGEMENT

59550, 59585

AIR-FUEL RATIO

58186, 58212, 58223, 58249, 58258, 58288,
58292, 58307, 58372, 58378, 58385, 58390,
58407, 58409, 58420, 58421, 58428, 58437,
58447, 58448, 58460, 58548, 58551, 58563,
58568, 58590, 58622, 58653, 58675, 58697,
58703, 58725, 58736, 58739, 58783, 58812,
58818, 58823, 58840, 58841, 58852, 58869,
58884, 58889, 58911, 58929, 58995, 59007,
59014, 59017, 59018, 59047, 59077, 59137,
59180, 59197, 59209, 59215, 59229, 59231,
59261, 59263, 59279, 59283, 59284, 59372,
59395, 59400, 59406, 59426, 59440, 59441,
59445, 59479, 59500, 59527, 59547, 59574,
59594, 59598, 59628, 59646, 59651, 59678,
59679, 59695

AIRCRAFT

58287, 58288, 59099, 59207, 59340, 59518,
59612, 59638

ALBANIA

59533

ALCOHOLS

58171, 58194, 58281, 58422, 58449, 58450,
58479, 58618, 58628, 58633, 58641, 58642,
58769, 58814, 58935, 58946, 59135, 59156,
59244, 59306, 59355, 59376, 59396, 59415,
59425, 59447, 59450, 59482, 59539

ALDEHYDES

58138, 58194, 58234, 58641, 58856, 59156,
59176, 59288, 59298, 59366, 59376, 59396,
59425, 59450, 59456, 59482, 59539, 59681

ALKALIES AND CHLORINE PLANTS

58105

ALKALINE ADDITIVES

58106, 58110, 58122, 58134, 58136, 58139,
58148, 58157, 58160, 58167, 58183, 58199,
58202, 58208, 58228, 58229, 58230, 58231,
58264, 58298, 58330, 58367, 58373, 58389,
58411, 58412, 58415, 58494, 58495, 58530,
58531, 58532, 58591, 58598, 58599, 58600,
58601, 58602, 58605, 58606, 58608, 58609,
58659, 58667, 58668, 58717, 58785, 58793,
58866, 58868, 58883, 58936, 58981, 58997,
59041, 59069, 59201, 59212, 59235, 59264,
59269, 59270, 59271, 59276, 59292, 59326,
59341, 59348, 59357, 59438, 59467, 59477,
59486, 59492, 59510, 59522, 59546, 59599,
59610, 59616, 59619, 59621, 59622, 59629,
59662

ALKALIZED ALUMINA

59481

ALUMINUM

59583, 59649

ALUMINUM COMPOUNDS

58163, 59583, 59671

ALUMINUM OXIDES

58333, 59647, 59650

ALUMINUM PRIMARY PRODUCTION

58290, 58423, 59554

AMIDES

58144, 58188, 58905, 59649

AMINES

58188, 58218, 58364, 58509, 58677, 58890,
59109, 59362, 59366, 59425, 59450, 59482,
59539, 59705

AMMONIA

58191, 58218, 58296, 58512, 58618, 58641,
58662, 58890, 58912, 58934, 58946, 58952,
58977, 59040, 59109, 59135, 59156, 59211,
59304, 59327, 59394, 59415, 59452, 59478,
59490, 59560, 59614, 59632, 59640

AMMONIA REDUCTION

58125, 58250, 58343, 58458, 58462, 58594,
58657, 58720, 58779, 58837, 58867, 58990,
59123, 59246, 59673

AMMONIUM CHLORIDE

58592

AMMONIUM COMPOUNDS

58191, 58218, 58296, 58512, 58592, 58618,
58641, 58662, 58890, 58912, 58934, 58946,
58952, 58964, 58977, 59040, 59109, 59135,
59156, 59211, 59304, 59327, 59394, 59415,
59452, 59478, 59490, 59560, 59599, 59614,
59632, 59640, 59661, 59673, 59694

ANIMALS (NON-HUMAN)

ANIMALS (NON-HUMAN)
58892, 59178, 59306, 59434

ANTHRACENES
59135

ANTIMONY COMPOUNDS
58969

APARTMENT INCINERATORS
59474

AQUEOUS SOLUTION SCRUBBING
58107, 58221, 58236, 58367, 58418, 58490,
58580, 58638, 58668, 58678, 58681, 58682,
58683, 58691, 58705, 58708, 58717, 58720,
58730, 58733, 58753, 58769, 58867, 58868,
58963, 58964, 59049, 59118, 59121, 59165,
59198, 59211, 59235, 59246, 59304, 59390,
59461, 59492, 59619, 59673

AREA SURVEYS
59489

AROMATIC HYDROCARBONS
58108, 58188, 58509, 58548, 58856, 58935,
59135, 59306, 59396, 59447, 59571, 59635,
59666

ARSENIC COMPOUNDS
58641, 58868

ARSINE
58641

ASBESTOS
58371

ASHES
58261, 58269, 58347, 58524, 58554, 58578,
58587, 58676, 58921, 59099, 59207, 59272,
59299, 59333

ASPHALT
58528, 59602

ASPHALT CONCRETE PLANTS (NON-REFINERIES)
59073

ASPHALT PAVING
59390, 59544

ASPIRATORS
59618

ATMOSPHERIC MOVEMENTS
59325, 59565, 59699

AUSTRALASIA
58337, 58339, 58364, 58397, 58421, 58423,
58727, 58748, 58802, 58805, 58918, 58938,
58971, 59163, 59186, 59471, 59485, 59583

AUSTRALIA
58337, 58397, 58727, 58748, 58802, 58938,
58971, 59163, 59471, 59485, 59583

AUSTRIA
58523, 58739, 58747

AUTOMATIC (MODIFIER)
58249, 58443, 58460, 58587, 58675, 58833,
58897, 58954, 58955, 59071, 59155, 59318,
59333, 59673

AUTOMATIC MEASUREMENT METHODS
58339, 58973, 59652

AUTOMOBILES
58158, 58187, 58194, 58213, 58214, 58222,
58223, 58225, 58268, 58317, 58385, 58390,
58421, 58441, 58445, 58465, 58466, 58491,
58533, 58551, 58563, 58590, 58614, 58628,
58633, 58673, 58686, 58693, 58697, 58752,
58783, 58801, 58836, 58846, 58885, 58914,
58935, 58971, 58991, 58994, 59018, 59056,
59108, 59128, 59146, 59148, 59149, 59196,
59210, 59255, 59263, 59273, 59306, 59355,

59372, 59375, 59395, 59407, 59426, 59442,
59453, 59455, 59464, 59478, 59480, 59505,
59527, 59557, 59566, 59614, 59625, 59646,
59664, 59677, 59678, 59679, 59682, 59691

AUTOMOTIVE EMISSION CONTROL
58137, 58140, 58158, 58162, 58186, 58187,
58189, 58194, 58198, 58207, 58212, 58213,
58214, 58217, 58223, 58225, 58235, 58237,
58238, 58249, 58256, 58258, 58270, 58272,
58277, 58285, 58288, 58292, 58301, 58305,
58307, 58310, 58312, 58320, 58331, 58332,
58337, 58338, 58340, 58344, 58349, 58360,
58363, 58371, 58372, 58378, 58385, 58390,
58405, 58406, 58407, 58408, 58409, 58420,
58421, 58428, 58431, 58437, 58440, 58441,
58447, 58448, 58460, 58465, 58470, 58473,
58474, 58475, 58476, 58489, 58491, 58498,
58500, 58501, 58503, 58510, 58518, 58520,
58523, 58533, 58534, 58537, 58538, 58539,
58541, 58548, 58549, 58550, 58551, 58562,
58563, 58564, 58567, 58568, 58569, 58570,
58585, 58588, 58590, 58593, 58613, 58614,
58615, 58616, 58622, 58623, 58625, 58628,
58629, 58633, 58634, 58635, 58653, 58661,
58670, 58672, 58673, 58675, 58686, 58688,
58689, 58697, 58698, 58703, 58718, 58723,
58725, 58729, 58735, 58736, 58737, 58739,
58740, 58745, 58747, 58752, 58758, 58762,
58764, 58772, 58773, 58774, 58776, 58783,
58787, 58791, 58792, 58794, 58801, 58802,
58806, 58807, 58809, 58812, 58815, 58817,
58818, 58823, 58824, 58836, 58839, 58840,
58841, 58845, 58848, 58849, 58850, 58852,
58869, 58871, 58872, 58873, 58880, 58884,
58889, 58893, 58897, 58898, 58899, 58908,
58909, 58911, 58914, 58929, 58947, 58954,
58959, 58968, 58971, 58975, 58976, 58984,
58987, 58991, 58994, 58995, 58999, 59002,
59007, 59009, 59014, 59015, 59016, 59017,
59018, 59027, 59028, 59032, 59033, 59042,
59047, 59052, 59055, 59071, 59072, 59074,
59077, 59078, 59081, 59088, 59100, 59102,
59107, 59108, 59110, 59111, 59127, 59128,
59129, 59131, 59137, 59143, 59146, 59147,
59148, 59149, 59152, 59169, 59174, 59175,
59176, 59180, 59181, 59184, 59185, 59187,
59188, 59197, 59202, 59206, 59209, 59214,
59215, 59229, 59231, 59240, 59241, 59246,
59250, 59257, 59259, 59261, 59263, 59273,
59277, 59278, 59279, 59280, 59281, 59282,
59283, 59284, 59285, 59294, 59306, 59310,
59315, 59339, 59340, 59342, 59345, 59349,
59350, 59356, 59359, 59367, 59369, 59371,
59372, 59375, 59383, 59386, 59387, 59393,
59395, 59400, 59403, 59406, 59407, 59409,
59411, 59412, 59419, 59426, 59439, 59440,
59441, 59442, 59445, 59454, 59455, 59462,
59478, 59479, 59484, 59489, 59497, 59500,
59505, 59513, 59527, 59531, 59538, 59547,
59552, 59557, 59566, 59570, 59571, 59574,
59576, 59578, 59587, 59594, 59598, 59614,
59618, 59625, 59628, 59635, 59639, 59646,
59651, 59664, 59677, 59678, 59679, 59682,
59683, 59690, 59691, 59695, 59701

AUXILIARY FUELS
58582, 59180

AVAILABILITY
58102, 58199, 58264, 58284, 58304, 58345,
58486, 58544, 58600, 58602, 58830, 58941,
59076, 59276, 59368, 59505

B

BACTERIA
58364, 59425

BAFFLES
58887, 59192, 59642, 59648, 59684

BAG FILTERS
58126, 58132, 58155, 58304, 58321, 58322,
58359, 58394, 58442, 58444, 58468, 58480,

58543, 58544, 58574, 58592, 58617, 58680,
58782, 58854, 58920, 58953, 58969, 59021,
59041, 59060, 59064, 59068, 59172, 59200,
59222, 59239, 59307, 59331, 59344, 59381,
59398, 59404, 59424, 59427, 59435, 59437,
59526, 59529, 59554, 59575, 59584, 59595,
59634, 59649, 59697, 59704

BARIIUM COMPOUNDS
58108, 59530, 59681

BASIC OXYGEN FURNACES
58580, 59323, 59423, 59515, 59657

BELGIUM
59540, 59690

BENZENES
58188, 58935, 59135, 59571

BENZOIC ACID
59294

BERYLLIUM COMPOUNDS
58641

BESSEMER CONVERTERS
59573

BIOLOGICAL DECAY
59036

BIRDS
59178

BITUMINOUS COAL
59537

BLACK LIQUOR OXIDATION
58808, 58900, 59560, 59608

BLAST FURNACE AND BASIC STEEL PRODUCTS M
58181, 58182, 58185, 58203, 58219, 58240,
58245, 58253, 58254, 58255, 58260, 58311,
58449, 58450, 58512, 58580, 58663, 58730,
58738, 58754, 58782, 58920, 58922, 58931,
58939, 59044, 59045, 59091, 59095, 59105,
59125, 59191, 59193, 59203, 59235, 59258,
59320, 59358, 59370, 59423, 59433, 59435,
59514, 59516, 59522, 59540, 59564, 59573,
59604, 59607, 59627, 59657, 59674, 59692

BLAST FURNACES
58240, 58730, 59091, 59358, 59423, 59604,
59627

BLOWBY
58235

BODIES OF WATER
58151, 58891

BOILERS
58111, 58116, 58118, 58132, 58196, 58201,
58220, 58242, 58264, 58282, 58304, 58316,
58330, 58397, 58401, 58412, 58414, 58415,
58455, 58463, 58482, 58509, 58530, 58532,
58544, 58546, 58561, 58571, 58587, 58595,
58609, 58668, 58684, 58720, 58727, 58779,
58788, 58795, 58859, 58867, 58875, 58878,
58884, 58887, 58930, 58990, 58993, 59029,
59030, 59121, 59177, 59236, 59260, 59269,
59276, 59315, 59376, 59411, 59491, 59492,
59495, 59512, 59540, 59548, 59551, 59564,
59575, 59603, 59608, 59610, 59613, 59636,
59658, 59662, 59667, 59668, 59671, 59675

BREATHING
58324

BRICK AND STRUCTURAL CLAY TILE WORKS
58886

BROMIDES
59621

BROMINE COMPOUNDS
59671

SUBJECT INDEX

BUBBLE CAP TOWERS

59528

BUILDINGS

58731, 58786, 58796, 58803, 58831, 58876,
59093, 59232, 59252, 59253, 59473, 59681,
59691

BULGARIA

58696

BURNING

58635, 58742, 59617, 59670

BUSES

59531, 59618

BY-PRODUCT RECOVERY

58106, 58110, 58112, 58114, 58115, 58123,
58127, 58134, 58139, 58140, 58150, 58173,
58176, 58177, 58180, 58190, 58197, 58203,
58211, 58224, 58228, 58231, 58235, 58236,
58239, 58245, 58247, 58248, 58259, 58282,
58284, 58308, 58313, 58369, 58373, 58392,
58404, 58418, 58430, 58435, 58456, 58484,
58487, 58508, 58512, 58516, 58533, 58540,
58575, 58582, 58589, 58610, 58612, 58617,
58621, 58624, 58640, 58651, 58663, 58676,
58691, 58694, 58717, 58732, 58744, 58756,
58767, 58786, 58829, 58853, 58862, 58868,
58892, 58900, 58912, 58933, 58936, 58939,
58940, 58946, 58950, 58963, 58964, 58966,
58970, 58977, 58998, 59010, 59011, 59036,
59037, 59054, 59058, 59090, 59092, 59097,
59117, 59125, 59168, 59181, 59183, 59190,
59191, 59204, 59223, 59226, 59243, 59246,
59264, 59267, 59304, 59319, 59327, 59337,
59347, 59348, 59361, 59362, 59363, 59370,
59378, 59399, 59423, 59424, 59430, 59431,
59432, 59446, 59457, 59470, 59481, 59485,
59486, 59495, 59528, 59529, 59533, 59548,
59549, 59560, 59567, 59575, 59582, 59588,
59599, 59601, 59602, 59606, 59610, 59611,
59616, 59619, 59621, 59629, 59630, 59633,
59640, 59641, 59654, 59655, 59658, 59659,
59662, 59667, 59672, 59674, 59676, 59694,
59699, 59700, 59705

C

CADMIUM COMPOUNDS

58969, 59222, 59578

CALCIUM COMPOUNDS

58163, 58775, 59207, 59530, 59558, 59675

CALIBRATION METHODS

58543, 59628

CALIFORNIA

59365

CAMERAS

58800

CANADA

58370, 58439, 58442, 58443, 58482, 58622,
58623, 58828, 58915, 58937, 58988, 58997,
59026, 59089, 59357, 59390, 59393, 59447,
59509, 59596, 59618, 59630, 59671

CAPITAL

58114, 58131, 58138, 58148, 58173, 58264,
58267, 58330, 58365, 58414, 58430, 58598,
58599, 58601, 58602, 58603, 58604, 58605,
58705, 58922, 58928, 58970, 58974, 59046,
59330, 59491, 59554, 59656

CARBIDES

59626

CARBON

58168, 58203, 58209, 58214, 58230, 58284,
58291, 58369, 58386, 58413, 58461, 58643,
58646, 58647, 58685, 58699, 58766, 58780,
58856, 58867, 58888, 58975, 58989, 58994,
59093, 59101, 59106, 59163, 59254, 59298,

59313, 59319, 59378, 59396, 59477, 59493,
59507, 59516, 59539, 59562, 59565, 59615,
59637, 59667

CARBON BLACK

58975, 59565, 59637, 59667

CARBON DIOXIDE

58117, 58275, 58350, 58430, 58431, 58462,
58487, 58556, 58558, 58578, 58619, 58621,
58649, 58696, 58821, 58825, 58844, 58862,
58877, 58883, 58946, 58981, 59037, 59038,
59077, 59109, 59135, 59202, 59394, 59420,
59434, 59456, 59532, 59558, 59573, 59593,
59600, 59680, 59685, 59697

CARBON DISULFIDE

58226, 58413, 59394, 59430, 59459, 59629

CARBON MONOXIDE

58111, 58117, 58121, 58138, 58158, 58180,
58186, 58187, 58192, 58194, 58207, 58225,
58233, 58237, 58242, 58249, 58257, 58274,
58275, 58282, 58286, 58287, 58292, 58293,
58294, 58307, 58333, 58337, 58339, 58345,
58346, 58350, 58361, 58368, 58372, 58378,
58385, 58405, 58421, 58422, 58431, 58453,
58474, 58475, 58507, 58517, 58523, 58550,
58551, 58556, 58563, 58569, 58618, 58625,
58628, 58629, 58633, 58641, 58649, 58652,
58672, 58687, 58688, 58689, 58693, 58697,
58698, 58714, 58725, 58726, 58728, 58739,
58740, 58749, 58758, 58760, 58796, 58801,
58802, 58812, 58815, 58821, 58823, 58825,
58836, 58841, 58844, 58856, 58869, 58870,
58877, 58885, 58908, 58914, 58954, 58966,
58971, 58980, 58982, 58987, 58992, 59017,
59024, 59029, 59032, 59033, 59038, 59047,
59052, 59063, 59077, 59081, 59088, 59102,
59103, 59109, 59128, 59130, 59133, 59135,
59146, 59151, 59152, 59170, 59184, 59197,
59202, 59209, 59210, 59229, 59231, 59234,
59237, 59240, 59250, 59263, 59273, 59277,
59278, 59279, 59280, 59281, 59282, 59283,
59284, 59288, 59294, 59306, 59318, 59323,
59345, 59349, 59356, 59360, 59370, 59372,
59375, 59378, 59379, 59386, 59391, 59394,
59395, 59402, 59403, 59406, 59426, 59436,
59442, 59443, 59445, 59453, 59455, 59456,
59468, 59478, 59484, 59489, 59490, 59502,
59505, 59514, 59527, 59544, 59553, 59557,
59566, 59570, 59573, 59578, 59593, 59594,
59596, 59598, 59600, 59617, 59628, 59646,
59650, 59657, 59678, 59679, 59681, 59684,
59690, 59691

CARBONATES

59558, 59655

CARBONATION

58631, 59191

CARBONYLS

58641, 59443, 59596, 59612, 59684

CARBURETION

58140, 58187, 58217, 58249, 58349, 58501,
58523, 58538, 58541, 58672, 58739, 58758,
58772, 58774, 58783, 58807, 58818, 58839,
58889, 59007, 59014, 59180, 59197, 59241,
59279, 59284, 59371, 59426, 59445, 59500,
59557, 59664, 59678, 59691

CARBURETOR EVAPORATION LOSSES

58772, 59306, 59508

CARCINOGENS

59306

CAT-OX PROCESS

58157, 59357

CATALYSIS

58125, 58149, 58158, 58191, 58192, 58200,
58207, 58225, 58233, 58241, 58243, 58250,
58257, 58259, 58260, 58272, 58276, 58278,
58291, 58293, 58294, 58305, 58318, 58337,
58342, 58343, 58351, 58357, 58362, 58363,

CATALYTIC OXIDATION

58373, 58379, 58393, 58429, 58439, 58440,
58441, 58444, 58456, 58458, 58462, 58472,
58477, 58513, 58517, 58522, 58526, 58536,
58540, 58549, 58594, 58625, 58629, 58630,
58632, 58645, 58646, 58650, 58652, 58656,
58657, 58687, 58688, 58689, 58692, 58693,
58698, 58707, 58714, 58735, 58740, 58761,
58776, 58779, 58801, 58817, 58819, 58838,
58841, 58849, 58850, 58857, 58860, 58867,
58880, 58882, 58895, 58896, 58908, 58951,
58961, 58962, 58972, 58975, 58977, 58980,
58987, 58992, 58999, 59032, 59038, 59041,
59053, 59065, 59077, 59087, 59088, 59102,
59103, 59104, 59120, 59130, 59132, 59154,
59156, 59177, 59179, 59210, 59254, 59259,
59264, 59294, 59296, 59300, 59306, 59322,
59349, 59356, 59359, 59360, 59367, 59379,
59383, 59386, 59393, 59399, 59406, 59409,
59419, 59430, 59436, 59455, 59460, 59464,
59468, 59478, 59482, 59484, 59505, 59517,
59519, 59525, 59530, 59543, 59568, 59570,
59571, 59578, 59592, 59593, 59596, 59597,
59600, 59602, 59614, 59625, 59630, 59645,
59650, 59666, 59687

CATALYSTS

58125, 58149, 58158, 58191, 58192, 58207,
58225, 58233, 58241, 58243, 58250, 58259,
58260, 58278, 58291, 58293, 58294, 58305,
58318, 58342, 58343, 58351, 58362, 58373,
58393, 58439, 58440, 58441, 58456, 58458,
58477, 58513, 58517, 58522, 58526, 58536,
58625, 58629, 58630, 58632, 58645, 58650,
58687, 58688, 58689, 58692, 58698, 58707,
58714, 58735, 58740, 58761, 58776, 58801,
58817, 58819, 58841, 58849, 58850, 58857,
58860, 58880, 58895, 58896, 58908, 58951,
58961, 58962, 58972, 58977, 58980, 58987,
58992, 58999, 59032, 59053, 59065, 59077,
59087, 59088, 59102, 59120, 59130, 59132,
59154, 59179, 59210, 59254, 59296, 59300,
59342, 59349, 59356, 59359, 59360, 59367,
59379, 59383, 59386, 59393, 59399, 59406,
59409, 59419, 59430, 59436, 59455, 59464,
59468, 59478, 59482, 59484, 59505, 59517,
59519, 59525, 59530, 59543, 59568, 59570,
59578, 59592, 59596, 59598, 59600, 59602,
59614, 59630, 59645, 59650, 59687

CATALYTIC ACTIVITY

58276, 58363, 58373, 58458, 58526, 58629,
58646, 58650, 58656, 58657, 58714, 58761,
58882, 58908, 59103, 59104, 59132, 59349,
59379, 59383, 59393, 59464, 59478, 59571,
59592, 59593, 59614, 59625

CATALYTIC AFTERBURNERS

58200, 58207, 58233, 58235, 58241, 58272,
58278, 58286, 58288, 58292, 58293, 58294,
58305, 58320, 58338, 58343, 58351, 58381,
58429, 58446, 58472, 58473, 58500, 58541,
58588, 58590, 58625, 58629, 58639, 58660,
58664, 58679, 58688, 58689, 58692, 58714,
58735, 58773, 58783, 58799, 58801, 58817,
58838, 58841, 58848, 58850, 58857, 58861,
58872, 58896, 58908, 58916, 58954, 58975,
58976, 58980, 58982, 58987, 58999, 59008,
59009, 59017, 59032, 59056, 59065, 59120,
59130, 59149, 59196, 59210, 59224, 59250,
59259, 59263, 59273, 59294, 59298, 59300,
59306, 59308, 59309, 59342, 59356, 59359,
59366, 59385, 59386, 59401, 59419, 59426,
59462, 59464, 59475, 59476, 59478, 59484,
59491, 59499, 59502, 59505, 59519, 59530,
59531, 59547, 59570, 59571, 59598, 59624,
59625

CATALYTIC OXIDATION

58158, 58188, 58191, 58227, 58233, 58241,
58272, 58278, 58292, 58294, 58311, 58320,
58337, 58379, 58381, 58429, 58441, 58472,
58522, 58526, 58590, 58611, 58642, 58647,
58648, 58652, 58688, 58689, 58693, 58698,
58714, 58761, 58779, 58808, 58838, 58841,
58872, 58896, 58900, 58929, 58954, 58961,
58975, 58977, 58980, 58982, 58987, 58999,
59032, 59041, 59102, 59103, 59149, 59156,

CEMENT PLANTS (HYDRAULIC)

59210, 59227, 59238, 59259, 59263, 59273,
59300, 59301, 59303, 59338, 59349, 59369,
59379, 59401, 59455, 59499, 59505, 59507,
59531, 59543, 59560, 59578, 59592, 59593,
59600, 59608, 59614, 59629, 59647, 59650,
59652, 59659, 59666

CEMENT PLANTS (HYDRAULIC)

58239, 58442, 58443, 58759, 58830, 58865,
58886, 59331, 59444, 59448

CEMENTS

58141, 59559, 59579, 59649

CENTRIFUGAL SEPARATORS

58147, 58214, 58240, 58299, 58336, 58341,
58346, 58383, 58387, 58399, 58423, 58452,
58597, 58691, 58700, 58721, 58738, 58777,
58790, 58808, 58831, 58881, 58886, 58917,
58918, 58944, 58948, 59019, 59073, 59143,
59173, 59200, 59225, 59239, 59264, 59294,
59307, 59348, 59382, 59388, 59435, 59463,
59465, 59471, 59486, 59506, 59534, 59558,
59579, 59601, 59617, 59636, 59696, 59699

CENTRIFUGAL SEPARATORS (NEC)

58399, 58597, 58831, 59019, 59506, 59696

CENTRIFUGATION

59485

CENTRIFUGED SEPARATION

59485

CERAMIC AND METAL-CERAMIC

FILTERS

58478

CERAMICS

58338, 58513, 58987, 59419

CHARCOAL

58284, 58369, 59163, 59477, 59507, 59562

CHEMICAL BONDS

59294

CHEMICAL COMPOSITION

58454, 58556, 58677, 58698, 58870, 58911,
59381, 59547, 59654

CHEMICAL METHODS

59650

CHEMICAL PROCESSES

59579, 59584, 59592, 59629, 59644, 59647,
59648, 59653, 59665, 59672, 59694, 59698,
59705

CHEMICALS AND ALLIED

MANUFACTURING

58105, 58119, 58125, 58131, 58165, 58188,
58190, 58244, 58279, 58330, 58343, 58389,
58430, 58438, 58542, 58558, 58589, 58642,
58656, 58662, 58694, 58705, 58769, 58945,
58946, 58952, 58998, 59024, 59035, 59037,
59087, 59141, 59173, 59182, 59198, 59199,
59230, 59295, 59304, 59309, 59317, 59324,
59343, 59366, 59396, 59399, 59425, 59508,
59524, 59526, 59614, 59617, 59665, 59672,
59676

CHINA

58786, 59601

CHLORIDES

58127, 58444, 58753, 59471, 59490, 59583,
59675

CHLORINATED HYDROCARBONS

58197, 58266, 58578, 58674, 58755, 58757,
59217, 59230, 59232, 59443, 59451, 59471

CHLORINE

58236, 58398, 58546, 58558, 58607, 58708,
58709, 58916, 58952, 59063, 59629

CHLORINE COMPOUNDS

58127, 58444, 58459, 58753, 59471, 59490,
59583, 59608, 59650, 59675

CHROMATOGRAPHY

59232, 59451

CHROMIUM

58940

CHROMIUM COMPOUNDS

58939, 59516, 59663

CHROMIUM OXIDES

59578

CINDERS

59091

CLAY

58514

CLEAN AIR ACT

58578, 59258

CLEANING

58328, 59001, 59485, 59495, 59506, 59509,
59551, 59554

COAL

58107, 58141, 58143, 58177, 58178, 58201,
58220, 58221, 58281, 58373, 58384, 58411,
58415, 58418, 58426, 58432, 58455, 58467,
58490, 58524, 58544, 58546, 58552, 58554,
58582, 58587, 58631, 58663, 58711, 58722,
58738, 58751, 58788, 58805, 58820, 58858,
58859, 58875, 58883, 58921, 58936, 59029,
59030, 59066, 59082, 59114, 59135, 59191,
59208, 59269, 59272, 59275, 59276, 59378,
59417, 59429, 59446, 59485, 59490, 59492,
59498, 59511, 59512, 59536, 59537, 59563,
59585, 59586, 59591, 59605, 59610, 59619,
59620, 59633, 59668, 59675

COAL CONVERSION

58106, 58109, 58140, 58150, 58161, 58246,
58330, 58356, 58373, 58426, 58432, 58434,
58456, 58467, 58540, 58549, 58554, 58617,
58618, 58619, 58620, 58631, 58641, 58712,
58722, 58736, 58746, 58797, 58827, 58844,
58855, 58974, 58983, 59054, 59076, 59079,
59135, 59162, 59191, 59208, 59270, 59302,
59352, 59353, 59378, 59384, 59394, 59400,
59420, 59490, 59537, 59616

COAL PREPARATION

58177, 58178, 58356, 58411, 58524, 58738,
58760, 58765, 58797, 58853, 58858, 58983,
59082, 59114, 59258, 59270, 59275, 59296,
59322, 59353, 59485, 59498, 59511, 59620,
59654

COALESCING

59026, 59195

COATING, ENGRAVING AND ALLIED

SERVICES

58592, 59198, 59199, 59309, 59321, 59413,
59425, 59624

COBALT COMPOUNDS

59578, 59695

COFFEE ROASTING

58861, 59309

COKE

58245, 58449, 58450, 58482, 58631, 58663,
58695, 58750, 58777, 59105, 59192, 59228,
59258, 59433

COKE OVENS

58245, 58260, 58512, 58754, 59044, 59045,
59125, 59203, 59433

COKE QUENCHING

58245, 58663

COLLECTORS (MECHANICAL)

58147, 58206, 58214, 58215, 58216, 58240,
58253, 58299, 58336, 58341, 58346, 58355,
58383, 58387, 58399, 58423, 58452, 58483,
58504, 58542, 58597, 58637, 58691, 58700,

58721, 58731, 58738, 58748, 58757, 58777,
58781, 58790, 58808, 58831, 58832, 58881,
58886, 58887, 58917, 58918, 58944, 58948,
58969, 58986, 58997, 59019, 59026, 59073,
59140, 59142, 59167, 59173, 59192, 59198,
59200, 59203, 59222, 59225, 59228, 59239,
59247, 59264, 59299, 59307, 59323, 59348,
59376, 59382, 59388, 59428, 59435, 59463,
59465, 59471, 59486, 59506, 59534, 59558,
59569, 59573, 59579, 59601, 59617, 59636,
59642, 59648, 59652, 59655, 59656, 59667,
59668, 59684, 59696, 59699

COLORIMETRY

59195, 59670

COMBUSTIBLES AND VOLATILES

58911

COMBUSTION

58111, 58121, 58162, 58163, 58180, 58201,
58205, 58256, 58309, 58360, 58372, 58403,
58406, 58407, 58433, 58487, 58507, 58512,
58523, 58545, 58553, 58557, 58579, 58561,
58576, 58590, 58635, 58672, 58684, 58720,
58721, 58751, 58770, 58800, 58810, 58844,
58856, 58883, 58909, 58921, 58926, 58929,
58955, 58988, 58993, 59009, 59034, 59055,
59128, 59129, 59157, 59166, 59178, 59194,
59206, 59236, 59237, 59273, 59309, 59318,
59328, 59336, 59340, 59391, 59402, 59432,
59512, 59518, 59534, 59544, 59569, 59593,
59655, 59690

COMBUSTION AIR

58111, 58116, 58121, 58196, 58201, 58205,
58212, 58220, 58223, 58281, 58307, 58340,
58397, 58401, 58437, 58448, 58475, 58477,
58491, 58492, 58500, 58503, 58507, 58541,
58545, 58547, 58548, 58551, 58559, 58561,
58567, 58577, 58623, 58653, 58670, 58684,
58720, 58725, 58728, 58737, 58751, 58772,
58777, 58789, 58812, 58841, 58845, 58856,
58877, 58926, 58955, 58966, 58993, 59009,
59027, 59029, 59030, 59077, 59107, 59110,
59129, 59157, 59194, 59202, 59226, 59248,
59250, 59260, 59299, 59318, 59346, 59360,
59369, 59424, 59441, 59455, 59534, 59536,
59573, 59603, 59636, 59641, 59658, 59671,
59678, 59679, 59695

COMBUSTION CHAMBERS

58205, 58297, 58307, 58342, 58378, 58407,
58420, 58437, 58447, 58491, 58510, 58520,
58577, 58627, 58635, 58703, 58725, 58726,
58764, 58787, 58812, 58824, 58893, 58894,
58926, 58932, 58958, 58959, 58988, 58995,
59002, 59039, 59051, 59129, 59188, 59231,
59336, 59346

COMBUSTION PRODUCTS

58121, 58197, 58201, 58204, 58242, 58256,
58261, 58269, 58347, 58356, 58381, 58433,
58454, 58492, 58524, 58545, 58554, 58559,
58578, 58587, 58625, 58644, 58659, 58676,
58684, 58728, 58749, 58810, 58843, 58844,
58856, 58883, 58912, 58921, 58929, 58955,
58988, 59030, 59046, 59051, 59069, 59091,
59099, 59116, 59118, 59151, 59157, 59162,
59169, 59194, 59207, 59219, 59236, 59237,
59260, 59272, 59299, 59318, 59333, 59336,
59391, 59492, 59518, 59534, 59536, 59553,
59558, 59567, 59578, 59596, 59607, 59616,
59627, 59631, 59632, 59640, 59641, 59650,
59658, 59661, 59669, 59671, 59695

COMMERCIAL EQUIPMENT

58186, 58267, 58430, 58432, 58757, 59173,
59273, 59280, 59337, 59461, 59494, 59579,
59603, 59652

COMMERCIAL FIRMS

58157, 59056, 59326, 59455, 59494

COMPOSTING

58296, 59274

COMPRESSION

59701

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SUBJECT INDEX

COMPUTER PROGRAMS

58180, 58496, 59097, 59242, 59535, 59550, 59635

COMPUTERS

58227, 58568, 59243, 59494, 59550

CONDENSATION

58214, 58763, 58946, 59142, 59195, 59238, 59298, 59575, 59596, 59608, 59624, 59630

CONDENSATION (ATMOSPHERIC)

58464

CONDENSATION SEPARATION

58452, 58927

CONSTRUCTION INDUSTRY

59390, 59544

CONSTRUCTION MATERIALS

58141, 58528, 58665, 58676, 58916, 59419, 59422, 59559, 59570, 59579, 59582, 59583, 59590, 59602, 59613, 59649, 59698

CONSTRUCTION OTHER THAN BUILDING

CONSTRU

59390, 59544

CONTACT PROCESS

59584, 59592

CONTINUOUS

58415, 58443, 58581, 59213, 59389, 59492

CONTINUOUS MONITORING

58295

CONTROL AGENCIES

59052, 59489, 59547, 59664

CONTROL METHODS-ROOMS

58443, 58755, 59435, 59554

CONTROL METHODS-ROOMS AND

OBJECTS

58443, 58755, 59435, 59554

CONTROL PROGRAMS

58106, 58820, 58904, 59052, 59429, 59489, 59550, 59585, 59686, 59688

COOKING (RETAIL)

58713, 59005, 59039, 59098

COOLING

58213, 58328, 58451, 58457, 58464, 58763, 58830, 58833, 58855, 58857, 59136, 59166, 59315, 59487, 59495, 59506, 59544, 59562, 59608, 59638, 59641, 59697

COOLING TOWERS

58135, 58464, 58617, 58618, 58711, 58931, 59560

COPPER

59584, 59704

COPPER ALLOYS

59704

COPPER COMPOUNDS

58714, 58868, 59222, 59578, 59614

COPPER PRIMARY SMELTING AND

REFINING

58148, 58572, 59362

CORONA

59084, 59447, 59561

CORROSION

58133, 58153, 58170, 58183, 58419, 58579, 58584, 58589, 58628, 59482, 59534, 59540, 59575, 59583, 59653, 59663, 59671, 59675, 59694, 59695

COST ANALYSIS

58114, 58175, 58267, 58300, 58404, 58594, 58969, 59026, 59067, 59096, 59121, 59275, 59466, 59502

COSTS

58105, 58112, 58114, 58115, 58122, 58128, 58138, 58139, 58147, 58148, 58164, 58165, 58173, 58180, 58196, 58202, 58219, 58227, 58239, 58251, 58254, 58255, 58264, 58267, 58274, 58283, 58306, 58315, 58326, 58330, 58345, 58365, 58379, 58414, 58430, 58523, 58543, 58552, 58598, 58599, 58601, 58605, 58676, 58705, 58711, 58716, 58717, 58722, 58753, 58798, 58830, 58866, 58886, 58890, 58919, 58922, 58928, 58970, 58974, 59026, 59030, 59070, 59090, 59118, 59161, 59163, 59179, 59189, 59198, 59258, 59276, 59313, 59326, 59330, 59337, 59352, 59355, 59357, 59363, 59368, 59389, 59401, 59404, 59422, 59424, 59437, 59457, 59461, 59488, 59491, 59493, 59520, 59537, 59550, 59561, 59566, 59569, 59572, 59574, 59575, 59582, 59584, 59593, 59604, 59606, 59611, 59617, 59630, 59639, 59653, 59654, 59655, 59656, 59662, 59667, 59670, 59672, 59683, 59688, 59692, 59697, 59699, 59700, 59704

COTTONS

58206

CRANKCASE EMISSIONS

58235, 58349, 58385, 58539, 58745, 58919, 58971, 59683

CRANKCASE LUBRICATION FUMES

58539

CRANKCASE VENTILATION AIR

58349, 58745

CRITERIA

58222, 58345, 58353, 58358, 59186, 59308, 59547, 59593, 59629, 59686, 59688, 59706

CROPS

58978

CRUDE OIL

58274, 58281, 58540, 58575, 58819, 58951

CRYSTAL STRUCTURE

58652, 59389

CUMULATIVE MEASUREMENT METHODS

59670

CUPOLAS

58146, 58180, 59506, 59575, 59706

CYANATES

59182

CYANIDES

58592, 58641, 59130, 59170, 59394

CYCLIC ALKANES

58652

CYCLONE FURNACES

58492, 58649, 59051

CYCLONES (CONTROL)

58147, 58214, 58240, 58341, 58346, 58383, 58423, 58691, 58721, 58738, 58777, 58790, 58808, 58886, 58917, 58918, 58948, 59019, 59073, 59200, 59225, 59239, 59264, 59299, 59307, 59382, 59435, 59465, 59471, 59601

CZECHOSLOVAKIA

58168, 58775, 58886, 58987, 59347, 59444, 59466, 59467, 59521, 59629, 59670, 59674

D

DAIRY PRODUCTS INDUSTRY

58175, 58918, 59186

DRYING

DATA ANALYSIS

59494

DATA HANDLING SYSTEMS

58180, 58496, 59097, 59242, 59494, 59535, 59550, 59635

DECISIONS

59052

DECOMPOSITION

58106, 58193, 58218, 58444, 58582, 58630, 58705, 58828, 58857, 59180, 59296, 59336, 59447, 59562, 59673

DENMARK

58625, 59421

DENSITY

59485, 59556

DEPOSITION PHENOMENA

59099

DIESEL ENGINES

58108, 58137, 58212, 58277, 58286, 58407, 58466, 58633, 58747, 58762, 58792, 58802, 58898, 58935, 58975, 58982, 59081, 59166, 59176, 59209, 59257, 59278, 59280, 59369, 59393, 59453, 59456, 59497, 59502, 59531, 59547, 59566, 59618, 59664, 59681, 59682, 59701

DIESEL FUELS

58838

DIFFUSION (ATMOSPHERIC)

59535, 59550

DIFFUSION MODELS

59535, 59550

DIFFUSION PHENOMENA

58257, 58810, 59294, 59509, 59553

DIGESTERS

59364, 59560, 59655

DILUTION

58222

DIMETHYL DISULFIDE

58808, 59364, 59615

DIPHENYLS

59396

DISPERSIONS

58724, 59053, 59157, 59438, 59501

DISSOCIATION

59031

DISTILLATE OILS

58507, 58834, 59636

DISTILLATION

58329, 59036, 59568

DOMESTIC HEATING

58314, 59332, 59487, 59603, 59629, 59695

DOUBLE CONTACT PROCESS (CONTROL)

58866

DROPLETS

58221, 59131, 59428, 59700

DRUGS

59698

DRY CLEANING PLANTS (EXCEPT RUG)

58457

DRY CLEANING SOLVENTS

58251, 58674

DRYING

58663, 58877, 58982, 59090, 59164, 59239, 59389, 59495, 59541, 59544, 59606, 59699

DUSTS

DUSTS

58139, 58141, 58145, 58146, 58147, 58155,
58161, 58166, 58170, 58185, 58195, 58203,
58206, 58215, 58216, 58219, 58221, 58230,
58239, 58240, 58254, 58255, 58279, 58299,
58303, 58321, 58322, 58323, 58325, 58354,
58355, 58359, 58369, 58374, 58377, 58395,
58443, 58480, 58481, 58490, 58495, 58502,
58504, 58514, 58530, 58535, 58542, 58574,
58586, 58589, 58592, 58595, 58597, 58610,
58617, 58618, 58620, 58632, 58637, 58668,
58680, 58681, 58682, 58683, 58691, 58701,
58705, 58717, 58733, 58734, 58743, 58759,
58760, 58768, 58775, 58778, 58781, 58782,
58816, 58831, 58832, 58868, 58876, 58877,
58879, 58886, 58892, 58918, 58923, 58925,
58927, 58939, 58940, 58944, 58953, 58969,
58997, 59006, 59019, 59022, 59025, 59035,
59043, 59073, 59079, 59084, 59095, 59096,
59109, 59115, 59118, 59121, 59126, 59139,
59140, 59172, 59193, 59200, 59203, 59220,
59225, 59234, 59235, 59239, 59247, 59265,
59266, 59268, 59271, 59272, 59290, 59293,
59299, 59307, 59323, 59334, 59370, 59376,
59380, 59381, 59388, 59404, 59417, 59418,
59420, 59421, 59423, 59424, 59427, 59435,
59448, 59473, 59490, 59504, 59506, 59514,
59515, 59526, 59534, 59540, 59542, 59559,
59564, 59579, 59590, 59591, 59595, 59597,
59601, 59604, 59605, 59623, 59627, 59634,
59643, 59652, 59653, 59657, 59668, 59670,
59672, 59674, 59675, 59693, 59696, 59697,
59702, 59704, 59706

DYNAMOMETERS

59453, 59530, 59594, 59598

E

ECONOMIC LOSSES

59683, 59700

ECONOMICS

58105, 58106, 58109, 58112, 58114, 58115,
58120, 58122, 58128, 58129, 58131, 58138,
58139, 58147, 58148, 58151, 58164, 58165,
58173, 58175, 58180, 58190, 58196, 58202,
58219, 58227, 58239, 58251, 58254, 58255,
58264, 58267, 58274, 58283, 58300, 58306,
58313, 58315, 58326, 58330, 58335, 58345,
58352, 58353, 58356, 58365, 58379, 58404,
58414, 58430, 58487, 58523, 58543, 58552,
58575, 58582, 58594, 58598, 58599, 58601,
58602, 58603, 58604, 58605, 58676, 58702,
58705, 58711, 58716, 58717, 58719, 58722,
58753, 58788, 58798, 58799, 58830, 58853,
58858, 58863, 58866, 58886, 58890, 58919,
58922, 58928, 58933, 58969, 58970, 58974,
58983, 59024, 59026, 59030, 59046, 59060,
59067, 59070, 59090, 59096, 59097, 59118,
59121, 59155, 59161, 59163, 59179, 59189,
59198, 59224, 59227, 59258, 59267, 59275,
59276, 59305, 59308, 59313, 59326, 59330,
59337, 59352, 59355, 59357, 59363, 59368,
59389, 59399, 59401, 59403, 59404, 59422,
59424, 59437, 59446, 59450, 59457, 59458,
59461, 59466, 59470, 59488, 59491, 59493,
59495, 59502, 59520, 59528, 59537, 59548,
59550, 59554, 59561, 59566, 59567, 59569,
59572, 59574, 59575, 59582, 59584, 59593,
59604, 59606, 59611, 59615, 59617, 59630,
59639, 59653, 59654, 59655, 59656, 59662,
59667, 59670, 59672, 59683, 59688, 59692,
59697, 59699, 59700, 59704

EDUCATION

58749

EFFICIENCY

58102, 58108, 58111, 58112, 58116, 58118,
58121, 58124, 58129, 58130, 58132, 58139,
58141, 58143, 58149, 58155, 58161, 58164,
58165, 58168, 58172, 58173, 58174, 58185,
58189, 58206, 58213, 58218, 58227, 58231,
58233, 58240, 58264, 58267, 58272, 58282,

AIR POLLUTION ABSTRACTS, JUNE 1976

58284, 58295, 58298, 58304, 58323, 58324,
58326, 58334, 58335, 58379, 58383, 58384,
58389, 58390, 58395, 58407, 58413, 58414,
58416, 58418, 58421, 58423, 58425, 58430,
58448, 58449, 58450, 58452, 58456, 58462,
58463, 58468, 58469, 58479, 58481, 58483,
58486, 58490, 58494, 58496, 58502, 58505,
58521, 58527, 58543, 58544, 58547, 58548,
58552, 58563, 58571, 58574, 58576, 58595,
58597, 58598, 58599, 58600, 58601, 58602,
58603, 58604, 58605, 58606, 58608, 58636,
58644, 58668, 58680, 58683, 58690, 58692,
58705, 58707, 58722, 58727, 58733, 58738,
58768, 58769, 58777, 58782, 58788, 58799,
58801, 58802, 58805, 58807, 58821, 58823,
58825, 58828, 58835, 58857, 58862, 58863,
58865, 58867, 58875, 58884, 58887, 58888,
58890, 58894, 58905, 58908, 58911, 58925,
58930, 58938, 58948, 58952, 58965, 58967,
58969, 58974, 58986, 58988, 58990, 58992,
59001, 59003, 59007, 59009, 59019, 59022,
59033, 59038, 59049, 59067, 59070, 59073,
59078, 59086, 59097, 59098, 59101, 59118,
59119, 59121, 59123, 59132, 59137, 59139,
59140, 59145, 59146, 59147, 59165, 59172,
59175, 59177, 59180, 59186, 59193, 59198,
59199, 59200, 59204, 59212, 59228, 59230,
59235, 59265, 59276, 59298, 59302, 59304,
59312, 59317, 59319, 59330, 59334, 59341,
59345, 59348, 59368, 59382, 59384, 59386,
59389, 59398, 59400, 59402, 59407, 59412,
59417, 59418, 59424, 59428, 59438, 59444,
59458, 59463, 59465, 59470, 59473, 59477,
59480, 59486, 59491, 59495, 59498, 59499,
59503, 59505, 59506, 59507, 59510, 59511,
59514, 59517, 59520, 59522, 59524, 59528,
59530, 59537, 59542, 59554, 59556, 59558,
59561, 59566, 59572, 59575, 59577, 59582,
59583, 59588, 59591, 59595, 59601, 59609,
59615, 59625, 59653, 59655, 59668, 59673,
59682, 59702, 59703, 59705

ELECTRIC BATTERIES

58387, 59004, 59407, 59576, 59618, 59682

ELECTRIC FURNACES

58219, 58253, 58782, 58920, 58940, 59095,
59193, 59370, 59381, 59529, 59564, 59575,
59697

ELECTRIC POWER GENERATION

58101, 58109, 58111, 58112, 58114, 58132,
58135, 58143, 58150, 58151, 58157, 58161,
58167, 58196, 58199, 58201, 58242, 58247,
58264, 58304, 58311, 58313, 58319, 58330,
58381, 58384, 58389, 58397, 58414, 58416,
58418, 58455, 58486, 58490, 58502, 58532,
58552, 58591, 58598, 58599, 58600, 58601,
58602, 58603, 58604, 58605, 58606, 58608,
58609, 58638, 58659, 58690, 58691, 58711,
58716, 58727, 58738, 58767, 58805, 58820,
58828, 58835, 58863, 58865, 58878, 58887,
58900, 58930, 58933, 58983, 59003, 59010,
59058, 59076, 59092, 59093, 59099, 59114,
59162, 59165, 59207, 59242, 59243, 59258,
59262, 59264, 59267, 59272, 59275, 59289,
59292, 59304, 59305, 59319, 59326, 59337,
59341, 59357, 59363, 59446, 59466, 59487,
59510, 59535, 59553, 59560, 59577, 59579,
59585, 59588, 59589, 59601, 59603, 59617,
59622, 59629, 59630, 59631, 59633, 59653,
59655, 59662, 59667, 59670, 59686, 59687

ELECTRIC POWER SOURCES

58150, 58151, 58317, 58387, 58471, 58573,
58996, 59004, 59208, 59403, 59407, 59531,
59566, 59570, 59576, 59618, 59664, 59682

ELECTRIC, GAS, AND SANITARY SERVICES

58101, 58109, 58111, 58112, 58114, 58128,
58132, 58135, 58142, 58143, 58144, 58150,
58151, 58157, 58161, 58167, 58176, 58196,
58199, 58201, 58204, 58210, 58211, 58218,
58239, 58242, 58246, 58247, 58264, 58269,
58296, 58297, 58304, 58309, 58311, 58313,
58319, 58323, 58330, 58346, 58347, 58364,

58365, 58374, 58381, 58383, 58384, 58389,
58397, 58414, 58416, 58418, 58424, 58434,
58435, 58455, 58486, 58490, 58502, 58527,
58532, 58545, 58546, 58552, 58553, 58556,
58557, 58582, 58591, 58598, 58599, 58600,
58601, 58602, 58603, 58604, 58605, 58606,
58608, 58609, 58612, 58638, 58659, 58665,
58671, 58676, 58690, 58691, 58704, 58711,
58716, 58727, 58728, 58731, 58732, 58738,
58767, 58805, 58820, 58828, 58835, 58863,
58865, 58878, 58887, 58900, 58912, 58913,
58930, 58933, 58950, 58960, 58969, 58970,
58972, 58983, 59000, 59003, 59010, 59051,
59058, 59062, 59076, 59089, 59092, 59093,
59099, 59109, 59114, 59150, 59155, 59162,
59165, 59178, 59207, 59219, 59220, 59227,
59242, 59243, 59256, 59258, 59262, 59264,
59267, 59272, 59274, 59275, 59289, 59292,
59304, 59305, 59307, 59319, 59324, 59326,
59328, 59333, 59337, 59341, 59343, 59344,
59357, 59363, 59365, 59366, 59373, 59396,
59405, 59408, 59415, 59425, 59434, 59443,
59446, 59449, 59466, 59474, 59487, 59494,
59496, 59499, 59501, 59510, 59535, 59539,
59553, 59558, 59560, 59577, 59579, 59582,
59585, 59588, 59589, 59601, 59602, 59603,
59606, 59617, 59622, 59629, 59630, 59631,
59633, 59641, 59653, 59655, 59662, 59667,
59670, 59684, 59686, 59687, 59698, 59699

ELECTRICAL MEASUREMENT DEVICES

58258, 58773, 58973, 59257

ELECTRICAL PROPERTIES

58193, 58227, 58265, 58324, 58384, 58455,
58581, 58675, 58804, 58805, 58854, 58865,
58921, 58938, 58985, 59043, 59084, 59086,
59139, 59208, 59312, 59414, 59417, 59418,
59447, 59542, 59556, 59561, 59597, 59642,
59671

ELECTRICAL RESISTANCE

58227, 58324, 58384, 58455, 58675, 58804,
58805, 58921, 59139, 59418, 59542, 59561,
59671

ELECTROCHEMICAL METHODS

59650

ELECTROLYSIS

59130, 59400, 59650, 59662

ELECTROMETALLURGICAL PRODUCTS

MILLS

58580, 58782, 58920, 58939, 59095, 59193,
59320, 59516, 59692

ELECTROSTATIC PRECIPITATORS

58118, 58139, 58142, 58144, 58147, 58172,
58181, 58182, 58227, 58247, 58282, 58323,
58324, 58346, 58383, 58384, 58418, 58425,
58442, 58443, 58455, 58493, 58496, 58497,
58502, 58505, 58535, 58581, 58595, 58606,
58609, 58638, 58669, 58700, 58701, 58702,
58727, 58759, 58782, 58804, 58805, 58808,
58865, 58876, 58878, 58886, 58917, 58921,
58923, 58925, 58927, 58938, 58945, 58948,
58952, 58965, 58967, 58969, 58985, 58986,
59001, 59041, 59075, 59083, 59084, 59086,
59095, 59096, 59115, 59123, 59126, 59139,
59162, 59165, 59200, 59205, 59233, 59266,
59307, 59331, 59334, 59344, 59374, 59388,
59404, 59414, 59417, 59418, 59421, 59422,
59447, 59465, 59473, 59491, 59514, 59515,
59542, 59545, 59548, 59554, 59556, 59561,
59575, 59579, 59584, 59597, 59601, 59617,
59636, 59642, 59653, 59655, 59656, 59668,
59671, 59672, 59675, 59692, 59702, 59706

EMISSION FACTORS

58138, 58327, 58358

EMISSION INVENTORIES

59046

EMISSION STANDARDS

58337, 58345, 58379, 58397, 58576, 58771,
58820, 59151, 59258, 59291, 59322, 59342,

SUBJECT INDEX

59363, 59443, 59474, 59489, 59513, 59547,
59570, 59636

EMULSIONS

58724, 59157, 59438, 59501

ENFORCEMENT PROCEDURES

58402, 59489

ENGINE DESIGN MODIFICATION

58137, 58162, 58189, 58212, 58223, 58235,
58237, 58238, 58270, 58277, 58307, 58312,
58332, 58340, 58363, 58372, 58378, 58385,
58405, 58406, 58407, 58408, 58420, 58431,
58447, 58474, 58491, 58498, 58510, 58520,
58523, 58539, 58564, 58568, 58585, 58593,
58614, 58615, 58616, 58622, 58623, 58633,
58634, 58635, 58633, 58729, 58737, 58745,
58747, 58752, 58762, 58764, 58772, 58791,
58792, 58809, 58812, 58823, 58824, 58852,
58873, 58909, 58947, 58959, 58968, 58971,
58984, 58994, 58995, 59009, 59015, 59016,
59028, 59042, 59055, 59072, 59074, 59081,
59108, 59128, 59129, 59143, 59147, 59149,
59152, 59169, 59175, 59181, 59188, 59202,
59209, 59229, 59231, 59250, 59284, 59310,
59339, 59340, 59369, 59387, 59407, 59412,
59462, 59497, 59509, 59513, 59547, 59570,
59576, 59664, 59677, 59682

ENGINE EMISSIONS

58108, 58137, 58158, 58186, 58187, 58194,
58198, 58207, 58213, 58214, 58217, 58225,
58233, 58234, 58235, 58237, 58243, 58249,
58256, 58258, 58272, 58274, 58277, 58278,
58286, 58287, 58288, 58292, 58301, 58302,
58305, 58307, 58312, 58320, 58326, 58327,
58331, 58332, 58333, 58337, 58338, 58344,
58345, 58349, 58360, 58361, 58362, 58372,
58382, 58385, 58390, 58405, 58407, 58408,
58409, 58421, 58422, 58431, 58437, 58440,
58441, 58445, 58447, 58451, 58453, 58460,
58465, 58466, 58470, 58474, 58475, 58476,
58477, 58478, 58489, 58491, 58498, 58500,
58501, 58503, 58508, 58510, 58518, 58520,
58523, 58526, 58534, 58537, 58538, 58539,
58548, 58549, 58550, 58551, 58562, 58563,
58564, 58566, 58568, 58569, 58570, 58585,
58590, 58593, 58607, 58613, 58614, 58616,
58625, 58628, 58629, 58633, 58634, 58651,
58652, 58660, 58661, 58670, 58672, 58673,
58675, 58686, 58688, 58689, 58692, 58693,
58697, 58698, 58706, 58718, 58720, 58723,
58729, 58735, 58739, 58740, 58745, 58747,
58752, 58758, 58761, 58762, 58764, 58771,
58772, 58773, 58774, 58776, 58778, 58783,
58784, 58789, 58791, 58794, 58796, 58801,
58802, 58807, 58809, 58812, 58817, 58818,
58824, 58825, 58836, 58840, 58841, 58845,
58847, 58848, 58849, 58850, 58852, 58869,
58870, 58871, 58872, 58873, 58874, 58880,
58885, 58889, 58893, 58896, 58897, 58898,
58899, 58903, 58908, 58909, 58910, 58911,
58914, 58919, 58930, 58935, 58937, 58947,
58954, 58966, 58968, 58971, 58975, 58976,
58982, 58984, 58987, 58991, 58994, 58996,
58999, 59000, 59002, 59004, 59008, 59015,
59016, 59017, 59018, 59027, 59028, 59032,
59033, 59042, 59047, 59052, 59055, 59056,
59065, 59077, 59078, 59081, 59087, 59088,
59102, 59107, 59110, 59111, 59124, 59127,
59128, 59130, 59131, 59133, 59134, 59136,
59143, 59144, 59145, 59146, 59148, 59149,
59152, 59153, 59159, 59160, 59166, 59174,
59175, 59176, 59180, 59181, 59183, 59184,
59185, 59187, 59188, 59197, 59209, 59210,
59215, 59221, 59229, 59231, 59234, 59240,
59246, 59249, 59250, 59255, 59257, 59259,
59261, 59263, 59273, 59277, 59278, 59279,
59280, 59281, 59282, 59283, 59284, 59285,
59288, 59294, 59300, 59306, 59310, 59328,
59335, 59339, 59342, 59345, 59350, 59354,
59356, 59367, 59371, 59372, 59375, 59383,
59386, 59387, 59393, 59395, 59400, 59403,
59406, 59409, 59426, 59436, 59440, 59441,
59445, 59453, 59455, 59456, 59462, 59464,
59475, 59476, 59478, 59479, 59484, 59488,

59489, 59497, 59502, 59505, 59508, 59513,
59527, 59538, 59547, 59552, 59557, 59566,
59570, 59574, 59576, 59578, 59587, 59594,
59598, 59614, 59618, 59625, 59628, 59632,
59635, 59638, 59642, 59646, 59651, 59664,
59677, 59678, 59679, 59681, 59682, 59683,
59690, 59691, 59701

ENGINE OPERATING CYCLES

58137, 58186, 58187, 58225, 58234, 58237,
58287, 58307, 58311, 58361, 58390, 58409,
58421, 58437, 58453, 58500, 58518, 58534,
58562, 58563, 58564, 58590, 58615, 58616,
58672, 58735, 58739, 58774, 58791, 58802,
58817, 58847, 58869, 58871, 58872, 58873,
58889, 58898, 58911, 58914, 58935, 58947,
58966, 59014, 59027, 59033, 59047, 59055,
59081, 59100, 59107, 59129, 59133, 59148,
59152, 59175, 59176, 59197, 59215, 59240,
59255, 59257, 59261, 59263, 59277, 59278,
59279, 59280, 59281, 59282, 59283, 59284,
59288, 59310, 59345, 59371, 59375, 59395,
59439, 59445, 59454, 59455, 59527, 59538,
59557, 59574, 59587, 59594, 59625, 59628,
59646, 59651, 59678, 59679, 59701

ENGINE OPERATION MODIFICATION

58140, 58162, 58186, 58187, 58189, 58212,
58217, 58223, 58235, 58249, 58258, 58277,
58285, 58288, 58292, 58301, 58307, 58320,
58349, 58360, 58372, 58378, 58385, 58390,
58407, 58409, 58420, 58421, 58428, 58437,
58447, 58448, 58460, 58474, 58476, 58501,
58523, 58533, 58534, 58538, 58541, 58548,
58551, 58563, 58567, 58568, 58570, 58590,
58615, 58616, 58622, 58653, 58670, 58672,
58673, 58675, 58686, 58697, 58703, 58725,
58736, 58739, 58758, 58764, 58772, 58773,
58774, 58783, 58787, 58802, 58806, 58807,
58812, 58818, 58823, 58839, 58840, 58841,
58852, 58869, 58872, 58884, 58889, 58897,
58898, 58899, 58911, 58914, 58929, 58954,
58959, 58971, 58975, 58995, 59007, 59014,
59017, 59018, 59027, 59047, 59071, 59077,
59100, 59107, 59137, 59148, 59149, 59174,
59176, 59180, 59181, 59187, 59197, 59206,
59209, 59214, 59215, 59229, 59231, 59241,
59261, 59263, 59273, 59277, 59279, 59281,
59283, 59284, 59335, 59345, 59350, 59371,
59372, 59387, 59395, 59400, 59406, 59411,
59426, 59439, 59440, 59441, 59442, 59445,
59462, 59479, 59500, 59527, 59538, 59547,
59552, 59557, 59574, 59587, 59594, 59598,
59618, 59628, 59646, 59651, 59664, 59678,
59679, 59682, 59690, 59691, 59695, 59701

ENGINEERS

58749, 59226

ENGINES

58108, 58112, 58137, 58143, 58151, 58162,
58198, 58212, 58217, 58223, 58233, 58234,
58235, 58237, 58238, 58243, 58270, 58272,
58277, 58286, 58292, 58301, 58307, 58310,
58312, 58320, 58331, 58332, 58340, 58348,
58349, 58360, 58361, 58372, 58378, 58382,
58390, 58405, 58406, 58407, 58408, 58420,
58421, 58422, 58429, 58431, 58437, 58446,
58447, 58448, 58451, 58465, 58466, 58472,
58473, 58474, 58476, 58477, 58491, 58498,
58500, 58501, 58503, 58508, 58510, 58520,
58523, 58533, 58537, 58538, 58548, 58549,
58551, 58562, 58564, 58567, 58568, 58569,
58570, 58573, 58585, 58590, 58593, 58614,
58615, 58616, 58622, 58625, 58633, 58634,
58653, 58654, 58660, 58670, 58672, 58675,
58686, 58689, 58692, 58698, 58722, 58723,
58726, 58729, 58736, 58737, 58739, 58740,
58745, 58747, 58758, 58761, 58762, 58764,
58772, 58773, 58774, 58778, 58787, 58789,
58791, 58792, 58794, 58802, 58806, 58809,
58812, 58818, 58823, 58824, 58825, 58852,
58871, 58889, 58893, 58894, 58897, 58898,
58909, 58910, 58911, 58919, 58930, 58934,
58935, 58937, 58942, 58947, 58959, 58966,
58968, 58975, 58982, 58984, 58987, 58988,
58995, 58996, 58999, 59002, 59004, 59007,

EUROPE

59008, 59009, 59014, 59015, 59016, 59017,
59018, 59027, 59032, 59033, 59042, 59055,
59058, 59065, 59071, 59072, 59074, 59078,
59081, 59087, 59088, 59100, 59108, 59111,
59124, 59127, 59128, 59129, 59136, 59144,
59146, 59147, 59148, 59149, 59152, 59153,
59160, 59166, 59169, 59175, 59176, 59180,
59187, 59188, 59202, 59206, 59209, 59214,
59229, 59231, 59241, 59242, 59243, 59248,
59250, 59257, 59259, 59261, 59273, 59277,
59278, 59279, 59280, 59281, 59282, 59283,
59284, 59288, 59289, 59335, 59339, 59340,
59350, 59354, 59356, 59367, 59369, 59371,
59393, 59400, 59406, 59407, 59410, 59412,
59439, 59440, 59441, 59442, 59445, 59453,
59454, 59456, 59468, 59475, 59476, 59479,
59480, 59497, 59502, 59513, 59518, 59531,
59538, 59547, 59552, 59566, 59570, 59574,
59576, 59587, 59594, 59598, 59618, 59628,
59642, 59664, 59681, 59682, 59690, 59701

ENTHALPY

59480

ENTROPY

59074

EQUIPMENT CRITERIA

58222, 59186, 59629, 59706

ETHYLENE

58158, 58575, 58695, 58714, 59571

EUROPE

58101, 58108, 58112, 58113, 58115, 58116,
58117, 58128, 58135, 58137, 58139, 58140,
58141, 58143, 58144, 58146, 58147, 58155,
58161, 58162, 58166, 58168, 58171, 58175,
58176, 58185, 58188, 58191, 58195, 58200,
58201, 58202, 58206, 58209, 58212, 58226,
58242, 58245, 58246, 58247, 58248, 58251,
58252, 58253, 58254, 58255, 58256, 58261,
58263, 58264, 58272, 58274, 58276, 58277,
58279, 58280, 58283, 58285, 58286, 58290,
58291, 58292, 58293, 58294, 58296, 58297,
58305, 58306, 58307, 58308, 58309, 58211,
58313, 58314, 58317, 58318, 58319, 58325,
58338, 58340, 58341, 58346, 58347, 58351,
58352, 58354, 58373, 58374, 58379, 58380,
58383, 58387, 58388, 58389, 58392, 58393,
58398, 58400, 58401, 58402, 58404, 58407,
58408, 58417, 58418, 58424, 58426, 58434,
58436, 58449, 58450, 58454, 58455, 58457,
58467, 58470, 58471, 58472, 58477, 58479,
58483, 58484, 58485, 58487, 58490, 58491,
58492, 58495, 58497, 58502, 58506, 58507,
58508, 58510, 58511, 58512, 58515, 58516,
58519, 58520, 58523, 58525, 58531, 58542,
58545, 58546, 58548, 58549, 58552, 58553,
58564, 58568, 58572, 58583, 58584, 58587,
58621, 58624, 58625, 58632, 58633, 58634,
58636, 58637, 58638, 58642, 58649, 58650,
58670, 58675, 58691, 58692, 58693, 58694,
58695, 58696, 58697, 58708, 58709, 58710,
58711, 58715, 58721, 58731, 58733, 58734,
58738, 58739, 58740, 58743, 58747, 58751,
58759, 58761, 58762, 58765, 58767, 58768,
58769, 58775, 58777, 58786, 58790, 58792,
58798, 58806, 58822, 58825, 58830, 58831,
58832, 58853, 58856, 58861, 58862, 58863,
58878, 58879, 58886, 58887, 58891, 58900,
58909, 58910, 58924, 58925, 58927, 58928,
58930, 58932, 58933, 58934, 58935, 58943,
58945, 58949, 58950, 58954, 58955, 58958,
58961, 58962, 58963, 58964, 58965, 58975,
58978, 58979, 58981, 58982, 58985, 58987,
58996, 58998, 58999, 59001, 59005, 59006,
59009, 59010, 59011, 59013, 59014, 59015,
59016, 59017, 59018, 59019, 59022, 59023,
59025, 59033, 59049, 59051, 59059, 59066,
59071, 59073, 59078, 59081, 59084, 59087,
59090, 59092, 59093, 59095, 59096, 59100,
59102, 59103, 59109, 59112, 59114, 59130,
59139, 59140, 59141, 59151, 59157, 59158,
59161, 59162, 59165, 59176, 59179, 59182,
59184, 59189, 59190, 59193, 59200, 59206,
59209, 59210, 59214, 59215, 59220, 59224,

EVAPORATION

59227, 59228, 59244, 59260, 59261, 59262,
59264, 59271, 59272, 59274, 59287, 59289,
59291, 59294, 59298, 59302, 59303, 59304,
59314, 59315, 59316, 59317, 59318, 59323,
59332, 59334, 59347, 59350, 59351, 59358,
59367, 59374, 59377, 59380, 59385, 59388,
59395, 59397, 59402, 59403, 59404, 59418,
59421, 59428, 59429, 59430, 59431, 59440,
59441, 59444, 59466, 59467, 59468, 59469,
59485, 59493, 59497, 59499, 59500, 59501,
59504, 59514, 59515, 59519, 59520, 59521,
59522, 59523, 59525, 59527, 59528, 59531,
59532, 59533, 59534, 59540, 59541, 59545,
59546, 59549, 59555, 59558, 59559, 59561,
59564, 59568, 59572, 59585, 59589, 59590,
59591, 59592, 59593, 59597, 59603, 59604,
59607, 59609, 59616, 59623, 59629, 59636,
59639, 59643, 59644, 59649, 59650, 59652,
59656, 59657, 59658, 59659, 59661, 59664,
59669, 59670, 59673, 59674, 59675, 59677,
59678, 59679, 59690, 59691, 59693, 59695,
59696, 59703

EVAPORATION

58628, 58969, 59142, 59364, 59608

EVAPORATORS

59324, 59364, 59560, 59700

EXCESS AIR

58111, 58116, 58201, 58220, 58397, 58401,
58503, 58507, 58559, 58561, 58720, 58777,
58856, 58877, 58993, 59027, 59029, 59157,
59194, 59226, 59534, 59536, 59603, 59671,
59679

EXCRETIONS

59434

EXHAUST SYSTEMS

58166, 58219, 58370, 58376, 58574, 58713,
58754, 59192, 59218, 59293, 59307, 59323,
59424, 59435, 59492, 59539, 59554, 59573,
59605, 59613, 59638, 59640, 59665, 59682,
59697, 59704

EXPLOSIONS

58222, 58303, 58891, 59265

EXTERNAL COMBUSTION ENGINES

58292, 58491, 58573, 58726, 59004, 59074,
59147, 59412, 59480, 59513, 59531, 59566,
59570

F

FABRIC FILTERS

58126, 58132, 58145, 58155, 58172, 58303,
58304, 58321, 58322, 58358, 58359, 58394,
58442, 58444, 58468, 58480, 58515, 58521,
58543, 58544, 58574, 58592, 58617, 58680,
58715, 58782, 58788, 58854, 58875, 58920,
58923, 58953, 58969, 59021, 59041, 59060,
59064, 59068, 59172, 59200, 59222, 59239,
59307, 59311, 59331, 59344, 59381, 59398,
59404, 59424, 59427, 59435, 59437, 59526,
59529, 59541, 59554, 59575, 59584, 59595,
59634, 59649, 59697, 59704

FANS (BLOWERS)

58219, 58574, 58754, 59218, 59293, 59424,
59435, 59492, 59539, 59573, 59613, 59640,
59697

FAT AND OIL PRODUCTION

58174, 58206, 58861, 58890, 59059, 59067,
59178, 59450

FEASIBILITY STUDIES

58104, 58114, 58131, 58969, 59330, 59352,
59355, 59502, 59582, 59654

FECES

59434

FEED PROCESSING

58417, 59491

FEEDLOTS

58522

FEEES

58800

FERROALLOY PRODUCTION-E

58920, 59193

FERTILIZER APPLICATION

59246

FIBER FILTERS

58155, 58386, 58481, 58757, 58942, 59297,
59404

FIELD OPERATIONS

58118, 58132, 58148, 58153, 58304, 58423,
58444, 58468, 58486, 58598, 58599, 58600,
58601, 58602, 58603, 58604, 58605, 58619,
58727, 58808, 59524, 59526, 59703

FIELD TESTS

58105, 58120, 58174, 58264, 58284, 58414,
58521, 58543, 58544, 58606, 58690, 58728,
58801, 58865, 58938, 59030, 59067, 59086,
59219, 59276, 59463, 59510, 59530, 59539,
59563, 59630

FILTER FABRICS

58124, 58126, 58141, 58341, 58442, 58444,
58468, 58521, 58544, 58680, 58920, 59022,
59172, 59266, 59437, 59491, 59577, 59581,
59595, 59617, 59636, 59643, 59649, 59652

FILTERS

58124, 58126, 58132, 58141, 58144, 58145,
58146, 58147, 58155, 58172, 58214, 58219,
58239, 58251, 58256, 58268, 58273, 58279,
58280, 58296, 58303, 58304, 58321, 58322,
58325, 58341, 58358, 58359, 58386, 58387,
58394, 58442, 58444, 58445, 58452, 58455,
58468, 58478, 58480, 58481, 58515, 58521,
58543, 58544, 58565, 58574, 58586, 58592,
58617, 58625, 58680, 58681, 58682, 58683,
58715, 58723, 58734, 58745, 58757, 58766,
58768, 58782, 58788, 58807, 58826, 58831,
58851, 58854, 58875, 58877, 58917, 58920,
58922, 58923, 58927, 58942, 58948, 58949,
58952, 58953, 58969, 59013, 59021, 59022,
59041, 59060, 59064, 59068, 59079, 59093,
59095, 59096, 59098, 59131, 59159, 59172,
59173, 59186, 59195, 59200, 59216, 59218,
59222, 59225, 59230, 59234, 59239, 59248,
59253, 59264, 59266, 59287, 59297, 59307,
59311, 59312, 59328, 59331, 59344, 59369,
59374, 59381, 59385, 59388, 59398, 59404,
59424, 59427, 59435, 59437, 59491, 59504,
59507, 59523, 59525, 59526, 59529, 59541,
59545, 59554, 59555, 59565, 59572, 59575,
59577, 59579, 59581, 59584, 59595, 59597,
59607, 59617, 59634, 59636, 59640, 59642,
59643, 59649, 59652, 59685, 59697, 59700,
59704

FINLAND

58545, 59189

FIRING METHODS

58111, 58113, 58116, 58121, 58156, 58171,
58175, 58179, 58194, 58196, 58201, 58204,
58205, 58212, 58220, 58223, 58245, 58274,
58281, 58283, 58288, 58307, 58340, 58365,
58397, 58401, 58433, 58437, 58447, 58448,
58466, 58475, 58477, 58489, 58491, 58492,
58500, 58503, 58506, 58507, 58541, 58545,
58547, 58548, 58549, 58551, 58557, 58559,
58561, 58567, 58577, 58582, 58618, 58623,
58628, 58653, 58659, 58670, 58672, 58677,
58684, 58720, 58725, 58728, 58737, 58749,
58751, 58772, 58777, 58784, 58789, 58810,
58812, 58841, 58844, 58845, 58856, 58859,
58877, 58884, 58910, 58913, 58926, 58929,
58935, 58936, 58955, 58966, 58993, 59004,
59009, 59011, 59015, 59027, 59029, 59030,
59046, 59050, 59062, 59066, 59076, 59077,
59107, 59110, 59116, 59129, 59157, 59180,
59192, 59194, 59202, 59221, 59226, 59229,

AIR POLLUTION ABSTRACTS, JUNE 1976

59237, 59248, 59250, 59260, 59299, 59306,
59318, 59346, 59353, 59360, 59369, 59402,
59424, 59429, 59441, 59455, 59534, 59536,
59538, 59540, 59552, 59573, 59598, 59603,
59606, 59636, 59641, 59658, 59671, 59678,
59679, 59695, 59701, 59706

FISH AND SEAFOOD PREPARATION

59519

FISH MEAL PRODUCTION

58861, 58890, 59059

FISSION POWER

58150, 58151

FLAME AFTERBURNERS

58198, 58205, 58307, 58308, 58417, 58500,
58590, 58625, 58648, 58673, 58679, 58721,
58773, 58799, 58815, 58825, 58829, 58861,
58893, 58916, 58956, 58966, 58982, 59002,
59017, 59024, 59039, 59061, 59107, 59111,
59190, 59224, 59240, 59284, 59298, 59308,
59309, 59366, 59385, 59397, 59401, 59470,
59474, 59491, 59570, 59598, 59624, 59635

FLAME IONIZATION DETECTOR (CO)

59232

FLAMES

58121, 58163, 58403, 58433, 58512, 58590,
58635, 58672, 58721, 58751, 58770, 58800,
58810, 58856, 58909, 58993, 59129, 59157,
59194, 59206, 59328, 59340, 59544

FLARES

58138, 58262, 58263, 58380, 58742, 58798,
58932, 58943, 58957, 59020, 59323, 59657

FLOATING ROOF TANKS

58798

FLORIDA

59496

FLUID FLOW

58102, 58124, 58160, 58222, 58312, 58340,
58399, 58431, 58478, 58481, 58482, 58566,
58626, 58653, 58669, 58747, 58804, 58819,
58828, 58833, 58874, 58915, 58957, 58988,
59007, 59012, 59014, 59049, 59084, 59158,
59297, 59349, 59350, 59460, 59504, 59509,
59607, 59613, 59614, 59638, 59647, 59658,
59666, 59673

FLUIDIZED BED PROCESSING

58128, 58140, 58159, 58160, 58261, 58290,
58316, 58356, 58411, 58432, 58524, 58556,
58572, 58631, 58659, 58671, 58704, 58712,
58816, 58827, 58883, 58912, 58915, 58936,
58960, 59012, 59034, 59041, 59058, 59069,
59079, 59080, 59104, 59135, 59270, 59319,
59360, 59378, 59471

FLUIDIZED BED SCRUBBERS

58102, 58879, 58925, 59471

FLUORESCENCE

59572

FLUORIDES

58190, 58423, 58641, 58879, 58952, 59167,
59477, 59524, 59526, 59554, 59583, 59611,
59617

FLUORINE

58190, 58572, 58607, 59063, 59524, 59526,
59629

FLUORINE COMPOUNDS

58190, 58423, 58641, 58879, 58952, 59167,
59477, 59524, 59526, 59554, 59583, 59604,
59611, 59617, 59623, 59676

FLY ASH

58118, 58140, 58227, 58383, 58384, 58414,
58455, 58544, 58666, 58676, 58678, 58727,
58744, 58777, 58875, 58921, 58938, 59029,
59089, 59155, 59162, 59293, 59347, 59417,

SUBJECT INDEX

59444, 59474, 59490, 59492, 59548, 59558,
59619, 59629, 59654, 59655, 59668, 59684,
59687, 59698, 59699

FLYWHEEL POWER

59028

FOG

58464

FOOD AND KINDRED PRODUCTS

INDUSTRY

58174, 58175, 58206, 58417, 58733, 58861,
58890, 58918, 59036, 59059, 59067, 59178,
59186, 59309, 59324, 59343, 59385, 59396,
59425, 59450, 59491, 59499, 59519, 59652

FORESTS

59222

FORMALDEHYDES

58856, 59156, 59376

FRANCE

58242, 58248, 58264, 58277, 58319, 58347,
58351, 58352, 58393, 58398, 58470, 58471,
58491, 58508, 58516, 58733, 58734, 58740,
58792, 58806, 58932, 58945, 58954, 58963,
58964, 58996, 59033, 59102, 59157, 59184,
59206, 59303, 59304, 59323, 59402, 59430,
59431, 59501, 59555, 59559, 59589, 59603,
59616, 59661, 59669, 59691, 59695

FREE RADICALS

58985, 59666

FUEL ADDITIVES

58108, 58194, 58310, 58349, 58454, 58509,
58569, 58576, 58639, 58802, 58846, 59099,
59166, 59207, 59248, 59255, 59282, 59530,
59547, 59612, 59639, 59671, 59675, 59681,
59695

FUEL ASH CONTENT

58695, 59258

FUEL CELLS

58151, 59208, 59403, 59531, 59576, 59682

FUEL CHARACTERISTICS

58139, 58177, 58178, 58201, 58265, 58283,
58287, 58373, 58454, 58455, 58456, 58461,
58482, 58536, 58540, 58556, 58561, 58631,
58650, 58695, 58738, 58750, 58797, 58805,
58827, 58858, 58866, 58870, 58921, 58935,
58991, 59003, 59082, 59105, 59113, 59114,
59121, 59180, 59249, 59258, 59267, 59270,
59275, 59291, 59292, 59296, 59306, 59322,
59353, 59375, 59378, 59429, 59435, 59485,
59495, 59498, 59511, 59517, 59537, 59568,
59610, 59620

FUEL CHARGING

58245, 58447, 58489, 58549, 58623, 58672,
58784, 58910, 59015, 59221, 59318, 59540,
59552, 59598, 59701

FUEL CRITERIA

59628

FUEL EVAPORATION

58302, 58326, 58327, 58344, 58385, 58470,
58518, 58651, 58706, 58771, 58772, 58818,
58903, 59134, 59145, 59185, 59306, 59354,
59488, 59508, 59683

FUEL GASES

58140, 58175, 58222, 58242, 58281, 58368,
58381, 58413, 58434, 58463, 58465, 58540,
58549, 58563, 58627, 58697, 58710, 58751,
58802, 58827, 58856, 58859, 58974, 59066,
59076, 59109, 59117, 59125, 59135, 59245,
59291, 59345, 59352, 59372, 59378, 59429,
59488, 59531, 59536, 59543, 59553, 59586,
59603, 59616, 59680, 59685, 59688, 59689

FUEL HEAT CONTENT

58283, 58540, 58695, 59258, 59435

FUEL OIL PREPARATION

58106, 58265, 58276, 58357, 58373, 58461,
58482, 58524, 58536, 58560, 58650, 58695,
58707, 58712, 58765, 58819, 58834, 58860,
58895, 58951, 59104, 59114, 59132, 59154,
59179, 59267, 59405, 59438, 59472, 59517,
59537, 59602, 59616, 59645, 59663

FUEL OILS

58106, 58107, 58150, 58151, 58175, 58242,
58265, 58274, 58275, 58276, 58281, 58287,
58319, 58357, 58360, 58373, 58428, 58461,
58492, 58507, 58536, 58540, 58560, 58561,
58575, 58650, 58668, 58690, 58695, 58707,
58724, 58751, 58819, 58834, 58855, 58860,
58875, 58884, 58895, 58951, 59011, 59058,
59066, 59104, 59113, 59117, 59118, 59121,
59132, 59154, 59260, 59267, 59292, 59352,
59429, 59438, 59517, 59534, 59536, 59537,
59548, 59578, 59582, 59585, 59602, 59603,
59636, 59643, 59645, 59667, 59668, 59671,
59695

FUEL RESOURCES

58106, 58151, 59322, 59620

FUEL SUBSTITUTION

58113, 58156, 58171, 58175, 58194, 58274,
58283, 58365, 58466, 58582, 58628, 58677,
58720, 58935, 59004, 59062, 59066, 59076,
59180, 59306, 59429

FUEL SULFUR CONTENT

58139, 58177, 58178, 58265, 58373, 58455,
58456, 58461, 58482, 58536, 58631, 58650,
58695, 58738, 58750, 58797, 58827, 58858,
58866, 58921, 59003, 59082, 59113, 59114,
59121, 59258, 59267, 59270, 59275, 59291,
59292, 59306, 59322, 59353, 59485, 59495,
59498, 59511, 59517, 59537, 59568

FUEL TANK EVAPORATION

58470, 58903, 59134, 59185, 59508

FUEL TREATMENT

58106, 58109, 58140, 58150, 58161, 58177,
58178, 58246, 58265, 58276, 58318, 58330,
58356, 58357, 58368, 58373, 58391, 58411,
58426, 58432, 58434, 58456, 58461, 58467,
58482, 58488, 58524, 58536, 58540, 58549,
58554, 58560, 58563, 58617, 58618, 58619,
58620, 58631, 58641, 58650, 58665, 58695,
58707, 58710, 58711, 58712, 58720, 58722,
58736, 58738, 58746, 58750, 58760, 58765,
58797, 58819, 58827, 58834, 58844, 58853,
58855, 58858, 58860, 58895, 58924, 58951,
58974, 58983, 59041, 59054, 59057, 59076,
59079, 59082, 59104, 59105, 59114, 59125,
59132, 59135, 59154, 59160, 59162, 59179,
59191, 59208, 59245, 59258, 59267, 59270,
59275, 59291, 59296, 59302, 59322, 59352,
59353, 59378, 59384, 59389, 59394, 59395,
59400, 59405, 59420, 59438, 59472, 59485,
59490, 59498, 59511, 59517, 59527, 59537,
59543, 59585, 59602, 59616, 59620, 59636,
59645, 59654, 59663, 59687

FUEL USAGE

58106, 58151, 58175, 58345, 58392, 58465,
58510, 58576, 58711, 58772, 58933, 58935,
59028, 59114, 59148, 59149, 59152, 59200,
59226, 59401, 59453, 59480

FUGITIVE DUST SOURCES

58244, 59272, 59307, 59435

FUMES

58182, 58184, 58197, 58204, 58347, 58350,
58395, 58398, 58528, 58589, 58782, 58796,
58803, 58829, 58920, 58940, 59039, 59095,
59173, 59230, 59303, 59320, 59376, 59380,
59401, 59516, 59529, 59531, 59540, 59575,
59583, 59617, 59618, 59626, 59672, 59690,
59704

FURNACES

58107, 58117, 58121, 58146, 58180, 58219,
58253, 58355, 58402, 58404, 58425, 58428,

GERMANY, FEDERAL REPUBLIC

58492, 58506, 58507, 58571, 58578, 58580,
58595, 58609, 58649, 58657, 58668, 58678,
58749, 58751, 58765, 58768, 58770, 58779,
58782, 58811, 58920, 58940, 59043, 59051,
59084, 59095, 59150, 59158, 59177, 59193,
59194, 59223, 59228, 59236, 59307, 59320,
59323, 59346, 59363, 59364, 59370, 59381,
59411, 59423, 59491, 59506, 59512, 59515,
59529, 59559, 59564, 59575, 59580, 59590,
59604, 59607, 59610, 59617, 59623, 59626,
59636, 59657, 59658, 59671, 59672, 59674,
59692, 59693, 59695, 59696, 59697, 59706

FUSION POWER

59305

G

GARAGES

59681, 59691

GAS CHROMATOGRAPHY

59232, 59451

GAS PRODUCTION AND DISTRIBUTION

59405

GAS SAMPLING

58295, 59232, 59451, 59573, 59584

GAS TURBINE ENGINES

58112, 58143, 58151, 58223, 58235, 58238,
58361, 58378, 58406, 58422, 58448, 58520,
58653, 58654, 58722, 58737, 58778, 58894,
58930, 58947, 58988, 59058, 59108, 59136,
59242, 59243, 59289, 59340, 59410, 59412,
59453, 59518, 59531, 59566, 59570, 59682

GASIFICATION

58106, 58109, 58140, 58150, 58161, 58246,
58330, 58356, 58373, 58426, 58432, 58434,
58467, 58540, 58549, 58617, 58619, 58620,
58641, 58712, 58722, 58736, 58746, 58827,
58844, 58855, 58974, 59054, 59076, 59079,
59135, 59162, 59270, 59302, 59352, 59378,
59384, 59394, 59400, 59420, 59490

GASOLINE SERVICE STATIONS

58315, 58326, 58327, 58344, 58375, 58651,
59094, 59134, 59145, 59185, 59306

GASOLINES

58272, 58235, 58310, 58315, 58326, 58327,
58344, 58363, 58375, 58391, 58454, 58470,
58549, 58563, 58576, 58639, 58651, 58763,
58860, 58870, 58903, 58924, 58934, 58935,
58991, 59113, 59145, 59180, 59185, 59249,
59255, 59306, 59355, 59383, 59400, 59453,
59454, 59530, 59557, 59568, 59571, 59614,
59616, 59635, 59639, 59646, 59682, 59683,
59690

GEO THERMAL POWER

58150, 58151, 59305

GERMAN DEMOCRATIC REPUBLIC

58139, 58697, 59224, 59404

GERMANY, FEDERAL REPUBLIC

58101, 58112, 58113, 58115, 58128, 58135,
58140, 58143, 58144, 58147, 58155, 58161,
58162, 58166, 58171, 58246, 58247, 58251,
58252, 58253, 58254, 58255, 58256, 58261,
58263, 58272, 58274, 58279, 58280, 58285,
58290, 58291, 58296, 58305, 58306, 58307,
58308, 58309, 58313, 58314, 58317, 58373,
58374, 58387, 58400, 58404, 58407, 58408,
58417, 58418, 58426, 58434, 58436, 58449,
58450, 58455, 58457, 58467, 58477, 58484,
58485, 58490, 58495, 58506, 58507, 58510,
58511, 58512, 58519, 58520, 58525, 58531,
58542, 58546, 58548, 58549, 58552, 58553,
58564, 58568, 58583, 58584, 58621, 58624,
58632, 58633, 58634, 58636, 58675, 58691,
58692, 58693, 58694, 58708, 58709, 58710,
58711, 58738, 58743, 58759, 58761, 58762,

GLASS

58765, 58767, 58768, 58790, 58798, 58825, 58830, 58831, 58832, 58853, 58878, 58887, 58933, 58934, 58935, 58949, 58958, 58961, 58962, 58975, 58979, 58981, 58982, 58998, 58999, 59009, 59010, 59011, 59014, 59015, 59016, 59017, 59018, 59019, 59022, 59023, 59025, 59081, 59087, 59090, 59092, 59095, 59096, 59100, 59109, 59141, 59161, 59176, 59190, 59200, 59210, 59214, 59215, 59220, 59227, 59228, 59261, 59274, 59289, 59302, 59315, 59318, 59332, 59358, 59367, 59374, 59385, 59388, 59428, 59440, 59441, 59468, 59469, 59497, 59514, 59515, 59534, 59540, 59541, 59564, 59593, 59604, 59609, 59623, 59636, 59639, 59643, 59650, 59657, 59659, 59664, 59693, 59696

GLASS

59582, 59590, 59698

GLASS FABRICS

58124, 58126, 58468, 59437, 59643

GLASS MANUFACTURING AND PROCESSING

58170, 58184, 58394, 58886

GRAIN PROCESSING

58417, 59491

GRAPHITE

59239

GRAVITATION

59485

GRAVITY COLLECTORS

58452, 58597, 58781, 58831, 58887, 59192, 59307, 59465, 59579, 59636, 59642, 59648, 59684

GRAVITY SETTLING (CONTROL)

58658

GREAT BRITAIN

58191, 58200, 58212, 58283, 58346, 58380, 58388, 58587, 58786, 58891, 58909, 58943, 58958, 58978, 59005, 59066, 59130, 59158, 59209, 59294, 59317, 59380, 59499, 59500, 59504, 59525, 59527, 59540, 59541, 59561, 59572, 59607, 59652, 59675

GREENBELTS

58786

GROUND LEVEL

59670

H

HALOGEN GASES

58190, 58236, 58398, 58546, 58558, 58572, 58607, 58708, 58709, 58916, 58952, 59063, 59093, 59524, 59526, 59593, 59629

HALOGENATED HYDROCARBONS

58197, 58266, 58578, 58674, 58755, 58757, 59217, 59230, 59232, 59443, 59451, 59471

HEALTH IMPAIRMENT

58904, 59200

HEALTH STATISTICS

58978

HEAT OF COMBUSTION

58303, 59658

HEAT TRANSFER

58163, 58180, 58213, 58328, 58342, 58426, 58427, 58446, 58451, 58457, 58464, 58484, 58508, 58533, 58539, 58579, 58756, 58763, 58795, 58817, 58830, 58833, 58850, 58855, 58857, 58894, 58966, 59074, 59090, 59097, 59136, 59158, 59166, 59183, 59226, 59315, 59317, 59378, 59420, 59444, 59487, 59495, 59506, 59544, 59562, 59569, 59606, 59608, 59624, 59638, 59641, 59697

HEAVY-DUTY VEHICLES

58453, 58551, 59331, 59598, 59618

HEPA FILTERS

59491

HEPTANES

59447

HEXANES

59152

HEXENES

59666

HISTORICAL ASPECTS

58225, 58866

HOGS

59434

HUMIDITY

58444, 59106, 59541, 59561, 59565, 59647

HUNGARY

58108, 58572, 58856, 59114, 59193

HYBRID POWER

58573, 59004, 59407

HYDRAZINES

58934

HYDROCARBON CONTROL

58725, 59426, 59436

HYDROCHLORIC ACID

58197, 58333, 58374, 58424, 58435, 58592, 58607, 58753, 58916, 59109, 59394, 59471, 59524, 59621, 59629, 59650, 59665

HYDROCYANIC ACID

58260, 59040, 59109

HYDRODESULFURIZATION

58106, 58276, 58357, 58373, 58482, 58524, 58560, 58707, 58819, 58860, 58895, 58951, 59132, 59154, 59179, 59517, 59616, 59645, 59663

HYDROELECTRIC POWER

58150, 58151

HYDROFLUORIC ACID

58215, 58290, 58333, 58374, 58424, 58435, 58641, 58879, 58916, 59063, 59109, 59477, 59483, 59524, 59526

HYDROGEN

58113, 58189, 58222, 58368, 58439, 58465, 58466, 58556, 58576, 58633, 58728, 58838, 58934, 58946, 59004, 59109, 59180, 59206, 59237, 59327, 59335, 59355, 59378, 59400, 59514, 59516, 59554, 59594, 59621, 59663

HYDROGEN SULFIDE

58115, 58209, 58218, 58224, 58248, 58259, 58296, 58306, 58308, 58350, 58364, 58413, 58430, 58482, 58485, 58487, 58488, 58511, 58516, 58524, 58611, 58617, 58619, 58620, 58621, 58696, 58769, 58808, 58862, 58890, 58973, 58977, 58981, 59023, 59037, 59044, 59045, 59053, 59079, 59085, 59091, 59109, 59117, 59125, 59135, 59170, 59178, 59189, 59191, 59256, 59267, 59301, 59304, 59316, 59327, 59329, 59351, 59364, 59365, 59394, 59396, 59405, 59430, 59431, 59432, 59459, 59496, 59507, 59533, 59565, 59567, 59586, 59596, 59608, 59615, 59616, 59621, 59629, 59630, 59650, 59655, 59663, 59680, 59685, 59703

HYDROGENATION

58467, 59294, 59296, 59537, 59616, 59645

HYDROLYSIS

58260, 59596

HYDROXIDES

58864, 59669

AIR POLLUTION ABSTRACTS, JUNE 1976

I

ICE

58871

IMPINGEMENT

59368

IN SITU

58328

INCINERATORS (REFUSE)

58128, 58142, 58144, 58204, 58210, 58211, 58246, 58247, 58297, 58309, 58323, 58346, 58347, 58374, 58424, 58434, 58435, 58545, 58546, 58553, 58557, 58582, 58671, 58704, 58728, 58732, 58878, 58913, 58950, 58960, 59010, 59062, 59089, 59109, 59150, 59155, 59219, 59307, 59324, 59328, 59333, 59344, 59373, 59408, 59443, 59474, 59501, 59558, 59560, 59579, 59582, 59606, 59641, 59684, 59698, 59699

INCINERATORS (WASTE GASES)

58144, 58197, 58198, 58200, 58205, 58207, 58233, 58235, 58241, 58261, 58272, 58278, 58286, 58288, 58292, 58293, 58294, 58305, 58307, 58308, 58320, 58338, 58343, 58346, 58351, 58364, 58381, 58395, 58417, 58429, 58446, 58472, 58473, 58500, 58541, 58547, 58577, 58588, 58590, 58625, 58629, 58639, 58648, 58649, 58651, 58660, 58664, 58666, 58673, 58679, 58688, 58689, 58692, 58694, 58714, 58721, 58735, 58754, 58773, 58783, 58799, 58801, 58814, 58815, 58817, 58821, 58825, 58829, 58838, 58841, 58848, 58850, 58857, 58861, 58862, 58872, 58890, 58893, 58896, 58908, 58912, 58916, 58925, 58932, 58954, 58956, 58958, 58966, 58975, 58976, 58980, 58982, 58987, 58999, 59002, 59008, 59009, 59017, 59024, 59032, 59039, 59040, 59050, 59051, 59056, 59061, 59065, 59094, 59107, 59111, 59120, 59127, 59128, 59130, 59149, 59164, 59190, 59196, 59210, 59224, 59227, 59240, 59250, 59259, 59263, 59273, 59284, 59294, 59298, 59300, 59306, 59308, 59309, 59317, 59321, 59324, 59328, 59342, 59356, 59359, 59366, 59373, 59376, 59385, 59386, 59397, 59401, 59415, 59419, 59426, 59450, 59462, 59464, 59470, 59471, 59474, 59475, 59476, 59478, 59484, 59491, 59499, 59502, 59505, 59519, 59530, 59531, 59547, 59567, 59570, 59571, 59598, 59624, 59625, 59635, 59664

INDIA

58189, 58197, 58385, 59036, 59037, 59057, 59389, 59426, 59524, 59526

INDOOR

58822, 58831, 59093, 59232, 59451

INDUSTRIAL AREAS

58786, 59550

INDUSTRIAL INORGANIC CHEMICAL

PLANTS

58105, 58119, 58125, 58131, 58330, 58389, 58998, 59199, 59524, 59526

INDUSTRIAL-COMMERCIAL

INCINERATORS

58297, 58671, 58704, 59089

INHALATION

58324

INHIBITION

59379

INORGANIC ACIDS

58197, 58215, 58290, 58333, 58374, 58424, 58435, 58461, 58589, 58592, 58607, 58636, 58641, 58753, 58756, 58879, 58916, 59063, 59109, 59177, 59234, 59254, 59394, 59471, 59477, 59483, 59495, 59496, 59524, 59526, 59533, 59549, 59584, 59592, 59610, 59611,

SUBJECT INDEX

59616, 59621, 59629, 59650, 59662, 59665,
59669, 59671, 59672, 59676, 59694, 59705

INORGANIC LIQUID SORPTION

59138

INORGANIC SOLID SORPTION

58160, 58609, 58709, 59106, 59467, 59533

INSPECTION

58186, 58187, 58234, 58245, 58303, 58361,
58390, 58402, 58421, 58453, 58563, 58783,
58802, 58885, 58914, 59052, 59263, 59266,
59277, 59278, 59279, 59280, 59281, 59282,
59283, 59284, 59288, 59345, 59395, 59472,
59527, 59618, 59653, 59678, 59682, 59700

INSTRUMENTATION

59155, 59618

INTERMITTENT (MODIFIER)

58415, 59492

INTERNAL COMBUSTION ENGINES

58108, 58137, 58162, 58198, 58212, 58217,
58233, 58234, 58235, 58237, 58243, 58270,
58272, 58277, 58286, 58292, 58301, 58307,
58310, 58312, 58320, 58331, 58332, 58340,
58348, 58349, 58360, 58372, 58382, 58390,
58405, 58407, 58408, 58420, 58421, 58429,
58431, 58437, 58446, 58447, 58451, 58465,
58466, 58472, 58473, 58474, 58476, 58477,
58498, 58500, 58501, 58503, 58508, 58510,
58523, 58533, 58537, 58548, 58549, 58551,
58562, 58564, 58567, 58568, 58569, 58570,
58573, 58585, 58590, 58593, 58614, 58615,
58616, 58622, 58625, 58633, 58634, 58660,
58670, 58672, 58675, 58686, 58689, 58692,
58698, 58723, 58729, 58736, 58739, 58740,
58745, 58747, 58758, 58761, 58762, 58764,
58772, 58773, 58774, 58787, 58789, 58791,
58792, 58794, 58802, 58806, 58809, 58812,
58818, 58823, 58824, 58825, 58852, 58871,
58889, 58893, 58897, 58898, 58909, 58910,
58911, 58919, 58934, 58935, 58942, 58959,
58966, 58968, 58975, 58982, 58984, 58987,
58995, 58999, 59002, 59004, 59007, 59008,
59009, 59014, 59015, 59016, 59017, 59018,
59027, 59032, 59033, 59042, 59055, 59065,
59071, 59072, 59081, 59087, 59088, 59100,
59111, 59124, 59127, 59128, 59129, 59144,
59146, 59148, 59149, 59152, 59153, 59160,
59166, 59169, 59175, 59176, 59180, 59187,
59188, 59202, 59206, 59209, 59214, 59229,
59231, 59241, 59248, 59250, 59257, 59259,
59261, 59273, 59277, 59278, 59279, 59280,
59281, 59282, 59283, 59284, 59288, 59335,
59339, 59350, 59354, 59356, 59367, 59369,
59371, 59393, 59406, 59439, 59440, 59441,
59442, 59445, 59453, 59454, 59456, 59468,
59475, 59476, 59479, 59497, 59502, 59531,
59538, 59547, 59552, 59566, 59570, 59574,
59576, 59587, 59594, 59598, 59618, 59628,
59642, 59664, 59681, 59682, 59690, 59701

INTERNATIONAL AGENCIES

59554

IODINE

59093

ION EXCHANGING

58716

IONS

58265

IRON

58939, 58940, 59378, 59546, 59573, 59604,
59623, 59637, 59649, 59663, 59697, 59706

IRON AND STEEL FOUNDRIES

58166, 58180, 58215, 58254, 58574, 59172,
59220, 59227, 59506

IRON COMPOUNDS

58203, 58641, 58705, 58775, 58868, 59207,
59381, 59423, 59435, 59533, 59661

IRON OXIDES

58182, 58730, 59191, 59578

ITALY

58276, 58338, 58340, 58354, 58472, 58487,
59071, 59260, 59350, 59377, 59403, 59493,
59531

J

JAPAN

58106, 58107, 58110, 58125, 58130, 58134,
58136, 58142, 58149, 58152, 58154, 58156,
58159, 58167, 58169, 58170, 58179, 58184,
58192, 58213, 58214, 58215, 58216, 58217,
58218, 58219, 58224, 58225, 58228, 58229,
58230, 58231, 58245, 58320, 58323, 58372,
58403, 58409, 58410, 58458, 58459, 58460,
58461, 58462, 58463, 58465, 58466, 58500,
58501, 58526, 58527, 58529, 58530, 58534,
58535, 58536, 58537, 58555, 58556, 58557,
58559, 58560, 58561, 58565, 58570, 58571,
58574, 58575, 58590, 58591, 58592, 58593,
58594, 58595, 58597, 58607, 58608, 58609,
58610, 58611, 58612, 58613, 58614, 58615,
58628, 58639, 58640, 58643, 58644, 58645,
58646, 58647, 58648, 58653, 58654, 58655,
58656, 58657, 58658, 58668, 58669, 58671,
58672, 58673, 58674, 58681, 58682, 58683,
58684, 58685, 58686, 58687, 58698, 58699,
58700, 58701, 58704, 58705, 58712, 58717,
58718, 58719, 58720, 58756, 58757, 58758,
58773, 58774, 58778, 58779, 58780, 58781,
58782, 58809, 58810, 58811, 58812, 58813,
58814, 58815, 58823, 58824, 58834, 58835,
58836, 58837, 58839, 58840, 58841, 58842,
58843, 58845, 58847, 58848, 58849, 58850,
58851, 58852, 58854, 58867, 58868, 58869,
58870, 58871, 58872, 58873, 58874, 58876,
58880, 58884, 58888, 58889, 58890, 58892,
58893, 58897, 58898, 58899, 58905, 58906,
58907, 58908, 58911, 58989, 58990, 58991,
58992, 58993, 58994, 58995, 59002, 59003,
59004, 59042, 59043, 59044, 59045, 59047,
59048, 59101, 59104, 59105, 59106, 59107,
59110, 59111, 59115, 59116, 59118, 59119,
59120, 59121, 59122, 59123, 59124, 59125,
59126, 59127, 59128, 59129, 59132, 59133,
59137, 59138, 59148, 59149, 59150, 59151,
59153, 59160, 59166, 59167, 59168, 59170,
59171, 59172, 59173, 59174, 59177, 59178,
59198, 59199, 59203, 59204, 59205, 59230,
59231, 59232, 59233, 59234, 59235, 59236,
59237, 59238, 59239, 59240, 59241, 59247,
59248, 59249, 59250, 59251, 59252, 59253,
59254, 59255, 59259, 59266, 59268, 59273,
59285, 59286, 59338, 59342, 59348, 59371,
59398, 59406, 59407, 59408, 59410, 59411,
59416, 59436, 59438, 59439, 59451, 59454,
59459, 59460, 59461, 59472, 59473, 59480,
59481, 59483, 59486, 59489, 59494, 59501,
59507, 59542, 59543, 59548, 59556, 59565,
59569, 59571, 59573, 59574, 59576, 59577,
59578, 59579, 59584, 59587, 59594, 59595,
59599, 59600, 59602, 59608, 59625, 59634,
59647, 59651, 59667, 59694

JET AIRCRAFT

58287, 59099, 59207, 59612, 59638

K

KEROSENE

58463, 58695, 58810, 58884, 59057, 59402,
59616

KETONES

59396, 59450, 59482

KILNS

58126, 58239, 58329, 58468, 58532, 58733,
58759, 58830, 59158, 59307, 59331, 59448,
59613, 59622, 59641, 59655

LIME/LIMESTONE PROCESSES

KRAFT (SULFATE) PULPING

58293, 58329, 58808, 58814, 59309, 59364,
59449, 59491, 59558, 59580, 59608, 59613,
59615, 59617, 59655, 59700

L

LABORATORY FACILITIES

59264

LACQUERS

58679

LAND USE PLANNING

59457

LANDFILLS

58365, 58676, 59415

LANDSCAPE ARCHITECTURE

58786

LEAD COMPOUNDS

58127, 58214, 58243, 58363, 58385, 58391,
58625, 58630, 58825, 58836, 58868, 58908,
58969, 58991, 59033, 59222, 59285, 59306,
59370, 59383, 59530, 59614, 59627, 59635,
59639

LEAD PRIMARY SMELTING AND

REFINING

58127, 58572, 59222

LEAD TIME

59275

LEADED GASOLINES

58235, 58363, 58454, 59249, 59383

LEATHER AND LEATHER PRODUCTS

INDUSTRY

59373

LEGISLATION

58397, 58578, 58582, 58991, 59258, 59444,
59684

LIGHT-DUTY VEHICLES

58158, 58187, 58194, 58213, 58214, 58222,
58223, 58225, 58268, 58317, 58385, 58390,
58421, 58441, 58445, 58465, 58466, 58491,
58533, 58551, 58563, 58590, 58614, 58628,
58633, 58673, 58686, 58693, 58697, 58752,
58783, 58801, 58836, 58846, 58885, 58914,
58935, 58971, 58991, 58994, 59018, 59028,
59056, 59108, 59128, 59146, 59148, 59149,
59196, 59210, 59255, 59263, 59273, 59282,
59306, 59342, 59355, 59372, 59375, 59395,
59407, 59426, 59442, 59453, 59455, 59464,
59478, 59480, 59505, 59527, 59557, 59566,
59614, 59625, 59646, 59664, 59677, 59678,
59679, 59682, 59691

LIGNITE

58118

LIME KILNS

58126, 58329, 58468, 58532, 58733, 59622,
59655

LIME PLANTS

58886, 59444

LIME/LIMESTONE PROCESSES

58106, 58110, 58122, 58136, 58139, 58148,
58157, 58160, 58167, 58183, 58199, 58202,
58208, 58228, 58229, 58230, 58231, 58298,
58330, 58367, 58389, 58411, 58412, 58415,
58494, 58495, 58531, 58532, 58591, 58598,
58599, 58600, 58601, 58602, 58605, 58606,
58608, 58609, 58659, 58667, 58668, 58793,
58866, 58883, 58936, 58997, 59069, 59212,
59235, 59264, 59269, 59270, 59271, 59292,
59326, 59341, 59357, 59467, 59492, 59510,
59522, 59546, 59619

LIMESTONE

LIMESTONE

58239, 58578, 59265, 59435, 59467, 59584,
59610, 59622, 59649

LIQUEFIED PETROLEUM GAS (LPG)

58627, 58802, 59076, 59372

LIQUID ATOMIZATION

58724, 58810

LIQUID INCINERATORS

58128, 58144, 59324, 59501

LITIGATION

58578

LONDON

58283

LUBRICANTS

58639, 58729, 58838, 58942, 59148, 59530

LUMBER AND WOOD PRODUCTS

INDUSTRY

59424

M

MAGNESIUM COMPOUNDS

58775, 59516, 59530, 59558

MAGNESIUM OXIDE PROCESS

58122, 58148, 58157, 58412, 58603, 58604,
58690, 58842, 59212, 59270, 59357, 59495

MAGNETOHYDRODYNAMICS (MHD)

59446, 59553, 59686

MAINTENANCE

58126, 58170, 58200, 58219, 58245, 58256,
58303, 58351, 58364, 58385, 58402, 58406,
58442, 58443, 58493, 58596, 58620, 58640,
58673, 58749, 58766, 58773, 58783, 58885,
58914, 58931, 58976, 59052, 59056, 59060,
59065, 59083, 59216, 59222, 59266, 59272,
59307, 59369, 59415, 59435, 59481, 59560,
59563, 59582, 59595, 59603, 59607, 59609,
59618, 59634, 59653, 59682, 59704

MANGANESE

58940

MANGANESE COMPOUNDS

58775, 59207, 59578, 59612, 59637, 59671

MANGANESE DIOXIDE PROCESS

59314, 59601, 59667

MANUFACTURING INDUSTRIES

58105, 58119, 58125, 58127, 58131, 58148,
58165, 58166, 58170, 58174, 58175, 58180,
58181, 58182, 58184, 58185, 58188, 58190,
58203, 58206, 58215, 58219, 58239, 58240,
58244, 58245, 58253, 58254, 58255, 58260,
58279, 58290, 58295, 58311, 58329, 58330,
58343, 58355, 58379, 58387, 58389, 58394,
58398, 58413, 58417, 58419, 58421, 58430,
58438, 58442, 58443, 58449, 58450, 58484,
58488, 58512, 58528, 58542, 58558, 58560,
58572, 58574, 58575, 58580, 58589, 58592,
58610, 58640, 58642, 58656, 58662, 58663,
58694, 58705, 58717, 58730, 58733, 58738,
58754, 58759, 58769, 58775, 58782, 58798,
58808, 58814, 58830, 58861, 58865, 58868,
58886, 58890, 58900, 58918, 58920, 58922,
58925, 58928, 58931, 58939, 58945, 58946,
58952, 58970, 58998, 59006, 59023, 59024,
59035, 59036, 59037, 59044, 59045, 59057,
59059, 59067, 59073, 59087, 59091, 59095,
59115, 59125, 59141, 59163, 59172, 59173,
59177, 59178, 59182, 59186, 59189, 59191,
59192, 59193, 59198, 59199, 59203, 59204,
59220, 59222, 59223, 59227, 59230, 59232,
59234, 59235, 59244, 59258, 59295, 59303,
59304, 59309, 59317, 59320, 59321, 59324,
59327, 59330, 59331, 59343, 59358, 59361,
59362, 59363, 59364, 59366, 59370, 59373,

59377, 59385, 59388, 59390, 59396, 59399,
59405, 59413, 59423, 59424, 59425, 59433,
59435, 59444, 59448, 59449, 59450, 59491,
59499, 59506, 59508, 59514, 59516, 59519,
59521, 59522, 59524, 59526, 59528, 59540,
59549, 59554, 59558, 59560, 59564, 59567,
59573, 59579, 59580, 59583, 59584, 59604,
59606, 59607, 59608, 59611, 59613, 59615,
59617, 59623, 59624, 59626, 59627, 59629,
59630, 59637, 59639, 59644, 59645, 59647,
59648, 59649, 59652, 59653, 59655, 59657,
59658, 59661, 59665, 59672, 59674, 59676,
59692, 59694, 59697, 59700, 59703, 59704,
59705, 59706

MARKETING

58582

MASS TRANSFER

58300, 58479, 58708

MATERIALS HANDLING

58221, 58245, 58266, 58269, 58355, 58443,
58466, 58587, 58589, 58733, 58903, 59217,
59307, 59373, 59423

MATHEMATICAL ANALYSES

58102, 58121, 58162, 58180, 58267, 58330,
58334, 58345, 58353, 58415, 58479, 58496,
58576, 58630, 58642, 58680, 58696, 58819,
58863, 58865, 58938, 58967, 59067, 59097,
59105, 59140, 59180, 59212, 59297, 59371,
59465, 59484, 59512, 59535, 59550, 59638,
59670

MATHEMATICAL MODELING

58102, 58121, 58162, 58180, 58334, 58345,
58353, 58415, 58496, 58576, 58630, 58642,
58680, 58696, 58819, 58863, 58865, 58967,
59067, 59105, 59180, 59371, 59484, 59512,
59535, 59550, 59638

MAXIMUM ALLOWABLE

CONCENTRATION

59559, 59664

MEAT PACKING PLANTS

58417, 59385

MEAT PRODUCTS INDUSTRY

58417, 58861, 59385

MELTING

58163, 59378

MEMBRANES

58198

MERCAPTANS

58218, 58364, 58398, 58417, 58808, 59053,
59364, 59366, 59396, 59415, 59425, 59447,
59450, 59482, 59539, 59608, 59615, 59616,
59655

MERCURY COMPOUNDS

58105, 58398, 58641, 58643, 58945, 59109,
59262

METAL COMPOUNDS

58105, 58108, 58127, 58144, 58163, 58203,
58214, 58230, 58243, 58276, 58363, 58385,
58391, 58398, 58592, 58625, 58630, 58641,
58643, 58655, 58705, 58714, 58753, 58775,
58825, 58836, 58855, 58868, 58895, 58908,
58927, 58939, 58945, 58969, 58991, 59033,
59063, 59109, 59139, 59207, 59222, 59262,
59285, 59306, 59370, 59381, 59383, 59423,
59435, 59490, 59516, 59530, 59533, 59549,
59558, 59578, 59583, 59593, 59599, 59612,
59614, 59621, 59627, 59635, 59637, 59639,
59643, 59650, 59655, 59661, 59662, 59663,
59671, 59675, 59681, 59693, 59695, 59697,
59700

METAL FABRICATION

58592, 58610, 59198, 59199, 59309, 59321,
59413, 59425, 59521, 59583, 59606, 59617,
59624, 59658, 59704, 59706

AIR POLLUTION ABSTRACTS, JUNE 1976

METAL INDUSTRIES

58127, 58148, 58166, 58180, 58181, 58182,
58185, 58203, 58215, 58219, 58240, 58245,
58253, 58254, 58255, 58260, 58290, 58311,
58355, 58379, 58387, 58423, 58449, 58450,
58512, 58542, 58572, 58574, 58580, 58663,
58730, 58738, 58754, 58775, 58782, 58868,
58920, 58922, 58931, 58939, 58998, 59006,
59044, 59045, 59091, 59095, 59105, 59125,
59172, 59191, 59192, 59193, 59203, 59204,
59220, 59222, 59227, 59234, 59235, 59258,
59320, 59358, 59361, 59362, 59363, 59370,
59388, 59396, 59423, 59433, 59435, 59506,
59514, 59516, 59522, 59540, 59549, 59554,
59564, 59573, 59579, 59584, 59604, 59607,
59617, 59623, 59626, 59627, 59629, 59630,
59637, 59647, 59648, 59649, 59653, 59657,
59658, 59674, 59692, 59694, 59697, 59704,
59705

METAL POISONING

59306

METALS

58133, 58153, 58183, 58338, 58351, 58939,
58940, 59378, 59386, 59472, 59546, 59573,
59582, 59583, 59584, 59604, 59623, 59637,
59649, 59650, 59663, 59697, 59704, 59706

METEOROLOGY

58319, 58444, 58464, 58519, 58904, 59106,
59325, 59535, 59541, 59561, 59565, 59631,
59647, 59687, 59699

METHANES

58222, 58365, 58576, 58912, 58934, 59038,
59109, 59135, 59434, 59571, 59650

METHYL MERCAPTANS

58398, 58808, 59364, 59447, 59615

METHYL SULFIDE

58808, 59615

METROPOLITAN AREAS

58337, 58345, 58471, 59063, 59489, 59534,
59585, 59618, 59691

MICROORGANISMS

58364, 58469, 59023, 59186, 59328, 59425,
59449, 59523

MINERAL PROCESSING

58127, 58195, 58514, 58877, 59239, 59307,
59522, 59579, 59590, 59617, 59633

MINERAL WOOL

59378

MINING

58286, 58328, 58734, 58863, 59114, 59222,
59265, 59307, 59369, 59432, 59456, 59617

MISSILE AND SPACECRAFT LAUNCH

VEHICLES

58333, 59632

MISSOURI

58546, 59222

MIST ELIMINATORS

58215, 58997, 59167, 59198, 59222

MISTS

58119, 58216, 58415, 58617, 58618, 58641,
58701, 58757, 58997, 59041, 59043, 59173,
59473, 59492, 59617, 59643, 59700, 59705

MIXING

58222, 58576, 58703, 59423

MONITORING

58186, 58242, 58295, 58303, 58304, 58319,
58339, 58521, 58641, 58798, 58800, 58920,
58957, 58973, 59020, 59155, 59186, 59222,
59288, 59489, 59494, 59573, 59618

MOUNTAINS

59222

SUBJECT INDEX

MULTIPLE CHAMBER INCINERATORS

59698

MULTIPLE-SOURCE STACKS

59325

MUNICIPAL INCINERATORS

58557, 58728, 58732, 59062, 59344, 59373

N

NATIONAL GOVERNMENTS

58711

NATURAL EMISSION SOURCES

59036

NATURAL GAS

58175, 58413, 58697, 58710, 58751, 58856, 59066, 59245, 59291, 59429, 59488, 59536, 59543, 59553, 59586, 59603, 59616, 59680, 59685, 59688, 59689

NATURAL GAS SWEETENING

59405

NETHERLANDS

58116, 58117, 58292, 58293, 58294, 58751, 58950, 59078, 59154, 59157, 59179, 59314, 59540, 59649

NETWORKS

58319

NEW YORK STATE

58345

NEW ZEALAND

58339, 58364, 58421, 58423, 58805, 58918, 59186

NICKEL

58940

NICKEL COMPOUNDS

58641, 59614

NITRATES

59063, 59669, 59673

NITRIC ACID

59177, 59650, 59669

NITRIC ACID PLANTS

58165, 58343, 58438, 58656, 59087, 59141, 59198, 59399

NITRIC OXIDE (NO)

58121, 58162, 58194, 58288, 58293, 58343, 58397, 58401, 58431, 58507, 58548, 58551, 58562, 58645, 58703, 58751, 58770, 58800, 58823, 58856, 59119, 59120, 59138, 59157, 59180, 59360, 59371, 59372, 59402, 59446, 59456, 59464, 59503, 59505, 59536, 59553, 59571, 59574, 59594, 59598, 59614, 59628, 59647, 59650, 59661, 59669

NITRILES

58188, 59040, 59396

NITRITES

59669, 59673

NITROGEN

58188, 58281, 58469, 58493, 58556, 58649, 58838, 59093, 59135, 59157, 59516, 59562

NITROGEN DIOXIDE (NO₂)

58214, 58343, 58548, 58641, 59029, 59106, 59120, 59447, 59453, 59489, 59503, 59566, 59594, 59632, 59650, 59669, 59684

NITROGEN ORGANIC COMPOUNDS

58144, 58188, 58218, 58244, 58364, 58366, 58509, 58677, 58704, 58890, 58905, 58946, 59074, 59109, 59362, 59366, 59415, 59425, 59450, 59482, 59539, 59649, 59705

NITROGEN OXIDES

58121, 58125, 58138, 58162, 58165, 58186, 58187, 58188, 58194, 58214, 58220, 58225, 58242, 58249, 58274, 58275, 58277, 58281, 58287, 58288, 58292, 58293, 58294, 58296, 58331, 58337, 58343, 58345, 58346, 58350, 58361, 58372, 58378, 58385, 58390, 58397, 58401, 58405, 58421, 58422, 58431, 58433, 58463, 58465, 58466, 58474, 58492, 58501, 58507, 58509, 58523, 58529, 58534, 58548, 58550, 58551, 58559, 58562, 58563, 58576, 58590, 58607, 58613, 58614, 58618, 58619, 58624, 58625, 58633, 58641, 58645, 58656, 58657, 58659, 58688, 58689, 58692, 58698, 58699, 58703, 58704, 58716, 58726, 58739, 58740, 58746, 58749, 58751, 58760, 58770, 58774, 58776, 58799, 58800, 58801, 58802, 58811, 58812, 58815, 58823, 58841, 58847, 58852, 58856, 58859, 58871, 58884, 58907, 58909, 58914, 58926, 58929, 58935, 58947, 58954, 58956, 58966, 58968, 58971, 59017, 59029, 59030, 59033, 59042, 59043, 59046, 59048, 59063, 59081, 59088, 59106, 59112, 59116, 59119, 59120, 59137, 59138, 59141, 59144, 59146, 59151, 59152, 59156, 59157, 59162, 59166, 59176, 59180, 59194, 59197, 59206, 59210, 59229, 59231, 59234, 59237, 59250, 59255, 59257, 59263, 59267, 59277, 59278, 59279, 59280, 59281, 59282, 59283, 59284, 59285, 59288, 59291, 59331, 59345, 59356, 59360, 59371, 59372, 59375, 59386, 59394, 59395, 59399, 59402, 59403, 59406, 59409, 59411, 59425, 59426, 59442, 59443, 59446, 59447, 59453, 59454, 59455, 59456, 59464, 59478, 59489, 59490, 59502, 59503, 59505, 59512, 59518, 59521, 59527, 59532, 59534, 59536, 59538, 59547, 59551, 59553, 59557, 59564, 59566, 59570, 59571, 59574, 59587, 59594, 59598, 59603, 59614, 59628, 59629, 59632, 59646, 59647, 59650, 59651, 59661, 59669, 59671, 59681, 59684, 59687

NITROGENOUS FERTILIZER PLANTS

58165, 58244, 58343, 58438, 58656, 58662, 59035, 59037, 59087, 59141, 59198, 59399

NITROUS ANHYDRIDE (N₂O₃)

59669

NITROUS OXIDE (N₂O)

58293

NON-METROPOLITAN AREAS

58978, 59222, 59585

NONFERROUS FOUNDRIES

58166, 58782, 59220

NORWAY

58861, 59059

NOX CONTROL

58107, 58125, 58165, 58196, 58201, 58250, 58272, 58307, 58343, 58362, 58410, 58438, 58458, 58462, 58537, 58557, 58561, 58570, 58571, 58594, 58644, 58657, 58662, 58668, 58684, 58686, 58689, 58699, 58719, 58720, 58725, 58776, 58779, 58785, 58799, 58837, 58843, 58849, 58867, 58880, 58905, 58906, 58956, 58990, 58993, 59041, 59077, 59087, 59105, 59106, 59118, 59119, 59122, 59123, 59129, 59138, 59148, 59198, 59199, 59202, 59210, 59236, 59246, 59260, 59273, 59294, 59338, 59340, 59342, 59360, 59391, 59399, 59439, 59461, 59503, 59536, 59553, 59673

NUCLEAR POWER

58150, 58151, 58519, 59305, 59332, 59420

NUCLEAR POWER PLANTS

58150, 58933, 59093, 59305, 59577, 59589, 59631, 59686

O

OCEANS

58151

OPERATING VARIABLES

OCTANES

59306, 59635, 59639

ODOR CONTROL

58164, 58174, 58193, 58218, 58251, 58268, 58296, 58300, 58306, 58329, 58364, 58381, 58386, 58395, 58396, 58398, 58417, 58469, 58522, 58528, 58545, 58583, 58617, 58618, 58664, 58674, 58677, 58710, 58721, 58808, 58814, 58822, 58829, 58836, 58861, 58890, 58898, 58928, 58972, 59000, 59005, 59023, 59036, 59059, 59061, 59067, 59070, 59113, 59178, 59220, 59224, 59230, 59244, 59251, 59298, 59299, 59308, 59309, 59324, 59325, 59343, 59364, 59365, 59366, 59369, 59373, 59376, 59380, 59385, 59392, 59396, 59401, 59415, 59425, 59434, 59449, 59458, 59482, 59496, 59499, 59519, 59539, 59569, 59608, 59615, 59616, 59636, 59652, 59655, 59699

ODOR COUNTERACTION

58164, 58218, 58268, 58306, 58417, 58522, 58545, 58890, 58928, 59070, 59251, 59308, 59365, 59385, 59401, 59415, 59458, 59496, 59499, 59519, 59569, 59608, 59616, 59636, 59652, 59655, 59699

ODOR MASKING

58677, 59251, 59308, 59366, 59380, 59392

ODORIMETRY

58329, 58664, 59036, 59299, 59373, 59608

ODOROUS POLLUTANTS

58174, 58193, 58251, 58268, 58296, 58300, 58306, 58329, 58341, 58346, 58364, 58381, 58386, 58395, 58396, 58417, 58527, 58528, 58545, 58583, 58617, 58618, 58626, 58664, 58677, 58710, 58713, 58721, 58742, 58822, 58829, 58861, 58890, 58898, 58925, 58928, 58969, 58972, 59000, 59005, 59023, 59036, 59059, 59061, 59067, 59113, 59178, 59224, 59251, 59299, 59308, 59309, 59324, 59325, 59343, 59364, 59365, 59366, 59369, 59373, 59376, 59380, 59385, 59392, 59396, 59401, 59415, 59425, 59434, 59443, 59449, 59450, 59453, 59458, 59470, 59482, 59490, 59494, 59496, 59499, 59508, 59539, 59547, 59569, 59636, 59652, 59655, 59665, 59698, 59705

OIL BURNERS

58107, 58121, 58402, 58506, 58507, 58749, 58811, 59636, 59671, 59695

OLEFINS

58158, 58337, 58575, 58695, 58714, 59113, 59389, 59571, 59666

OLFACTION

59392

OPEN BURNING

59617, 59670

OPEN HEARTH FURNACES

58425, 59084, 59692

OPEN PIT INCINERATORS

59219

OPERATING COSTS

58105, 58114, 58128, 58138, 58148, 58173, 58180, 58251, 58264, 58267, 58330, 58414, 58430, 58598, 58599, 58601, 58605, 58705, 58717, 58722, 58928, 58970, 59070, 59118, 59198, 59258, 59276, 59330, 59368, 59389, 59401, 59404, 59491, 59656

OPERATING CRITERIA

58353, 58358, 59308, 59547, 59593, 59686, 59706

OPERATING VARIABLES

58102, 58114, 58118, 58119, 58121, 58124, 58125, 58129, 58131, 58132, 58133, 58138, 58141, 58143, 58145, 58148, 58153, 58165, 58174, 58178, 58181, 58182, 58183, 58185, 58197, 58201, 58204, 58252, 58258, 58264,

ORGANIC ACIDS

58284, 58298, 58304, 58330, 58333, 58334, 58335, 58346, 58353, 58358, 58378, 58379, 58384, 58385, 58397, 58411, 58412, 58414, 58416, 58423, 58433, 58456, 58468, 58494, 58496, 58509, 58516, 58521, 58544, 58576, 58596, 58597, 58600, 58601, 58602, 58605, 58606, 58618, 58619, 58624, 58626, 58631, 58632, 58644, 58657, 58659, 58667, 58680, 58690, 58702, 58708, 58727, 58728, 58746, 58749, 58788, 58790, 58797, 58804, 58805, 58819, 58832, 58844, 58856, 58859, 58865, 58867, 58875, 58883, 58895, 58907, 58912, 58920, 58922, 58936, 58938, 58941, 58943, 58948, 58967, 58973, 58997, 59020, 59029, 59030, 59046, 59047, 59057, 59067, 59069, 59079, 59084, 59085, 59106, 59148, 59163, 59180, 59193, 59194, 59201, 59212, 59228, 59229, 59292, 59308, 59311, 59319, 59325, 59330, 59341, 59343, 59344, 59351, 59367, 59368, 59371, 59382, 59393, 59394, 59399, 59402, 59414, 59446, 59452, 59454, 59464, 59465, 59470, 59477, 59482, 59491, 59498, 59500, 59503, 59507, 59510, 59511, 59515, 59517, 59528, 59533, 59537, 59542, 59543, 59546, 59556, 59560, 59561, 59564, 59574, 59575, 59576, 59579, 59580, 59582, 59585, 59592, 59594, 59596, 59597, 59604, 59607, 59609, 59610, 59613, 59614, 59615, 59625, 59626, 59628, 59630, 59638, 59645, 59647, 59651, 59654, 59655, 59663, 59671, 59697, 59701, 59704

ORGANIC ACIDS

58260, 58821, 59024, 59040, 59109, 59294, 59366, 59438, 59482, 59539

ORGANIC WASTES

58210, 58211, 58364, 58365, 58972, 59000, 59051, 59227, 59324, 59366, 59425, 59434, 59582, 59698

ORGANOMETALLICS

59207, 59593, 59612, 59695

ORSAT ANALYSIS

58804

OSAKA

59489

OVERFIRE AIR

58196, 58728, 59029, 59030

OXIDANTS

58648, 59306, 59681

OXIDATION

58149, 58158, 58164, 58169, 58209, 58218, 58243, 58256, 58293, 58306, 58307, 58368, 58417, 58475, 58522, 58571, 58583, 58624, 58625, 58629, 58642, 58779, 58867, 58890, 58969, 58972, 58977, 59023, 59091, 59118, 59120, 59160, 59256, 59264, 59343, 59348, 59349, 59373, 59379, 59385, 59391, 59399, 59425, 59447, 59449, 59455, 59458, 59469, 59478, 59484, 59486, 59511, 59521, 59539, 59553, 59669

OXYGEN

58431, 58439, 58462, 58675, 58905, 58955, 59109, 59335, 59342, 59562, 59593

OZONE

58337, 58469, 58493, 58857, 59063, 59373, 59449, 59562, 59690

P

PACKED TOWERS

58300, 58799, 58879, 59067, 59380, 59458, 59463, 59481, 59622, 59661

PAINTS

59606, 59624

PAINTS AND ALLIED PRODUCTION

59309, 59317, 59508

SI-14

AIR POLLUTION ABSTRACTS, JUNE 1976

PAPER AND ALLIED MANUFACTURING

58295, 58329, 58484, 58808, 58814, 58900, 58925, 59023, 59189, 59309, 59364, 59377, 59425, 59449, 59491, 59528, 59558, 59560, 59580, 59608, 59613, 59615, 59617, 59644, 59653, 59655, 59700

PAPER MILLS

58900, 59377, 59425, 59560, 59613, 59644, 59653

PARTICLE COUNTING

59572

PARTICLE ENTRAINMENT

58123, 58213, 58334, 58499

PARTICLE GROWTH

58103, 58104, 58123, 58129, 58499, 58524, 59142, 59157, 59621, 59627

PARTICLE INVESTIGATION METHODS

58452, 58927, 59368, 59572

PARTICLE SEPARATION

58452, 58927, 59368

PARTICLE SIZE

58103, 58108, 58123, 58129, 58216, 58304, 58324, 58335, 58395, 58482, 58496, 58499, 58514, 58667, 58702, 58819, 58938, 58944, 58948, 58986, 59026, 59034, 59142, 59205, 59297, 59414, 59473, 59555, 59561, 59572, 59582, 59642, 59668, 59672, 59697, 59705, 59706

PARTICLE SIZE DISTRIBUTION

58358, 58804, 58865, 59465, 59504

PARTICULATE SAMPLING

58295, 59583

PAVING AND ROOFING MATERIALS

PRODUCTION

58528, 59073, 59390

PENELEC PROCESS

59659

PERFORMANCE STANDARDS

58337, 58345, 58379, 58397, 58576, 58771, 58820, 59151, 59258, 59291, 59322, 59342, 59363, 59443, 59474, 59489, 59513, 59547, 59570, 59636

PERMEABILITY

58198, 58715, 59572, 59595, 59643

PEROXYACETYL NITRATE

59063

PEROXYACYL NITRATES

59063

PERSONNEL

58749, 59056, 59226

PESTICIDES

59641, 59665

PETER SPENCE PROCESS (CLAUS)

58115, 58259, 58308, 58413, 58485, 58618, 58620, 58973, 59168, 59346, 59394, 59405, 59616, 59630

PETROLEUM AND COAL PRODUCTS

INDUSTRY

58488, 58528, 58560, 58575, 58640, 58798, 58861, 59057, 59073, 59177, 59223, 59244, 59303, 59327, 59330, 59390, 59405, 59567, 59617, 59639, 59645, 59661

PETROLEUM PRODUCTION

58328

PETROLEUM REFINING

58488, 58560, 58575, 58640, 58798, 58861, 59057, 59223, 59303, 59327, 59330, 59405, 59567, 59617, 59639, 59645, 59661

PH

58149, 58176, 58181, 58667, 58793, 58902, 58904, 59201, 59269, 59316, 59458, 59461, 59583, 59669

PHENOLS

58449, 58450, 58479, 58618, 58641, 58642, 58769, 59135, 59156, 59244, 59376, 59415, 59425

PHENYL COMPOUNDS

59396

PHENYLS

59396

PHOSPHATIC FERTILIZER PLANTS

58190, 58589, 59037, 59524, 59526

PHOSPHORIC ACID

58589, 59672, 59705

PHOSPHORUS COMPOUNDS

58144, 58838, 58952, 59516, 59530, 59637, 59672

PHOSPHORUS ORGANIC COMPOUNDS

59665

PHOTOCHEMICAL REACTIONS

59635

PHOTOGRAPHIC METHODS

58309, 58800

PHOTOMETRIC METHODS

59020, 59572

PHTHALIC ACID

58821

PHYSICAL METHODS

58373

PILOT PLANTS

58120, 58164, 58173, 58174, 58220, 58264, 58298, 58333, 58335, 58416, 58479, 58544, 58691, 58746, 58788, 58804, 58805, 58936, 58940, 59193, 59319, 59337, 59341, 59417, 59420, 59463, 59471, 59582, 59588, 59610, 59622, 59703

PLANNING AND ZONING

58767, 59457, 59535, 59585

PLANT DAMAGE

58904

PLANT GROWTH AND DEVELOPMENT

58904

PLASTICS

58163, 58584, 58701, 59150, 59602, 59641, 59660, 59698

PLASTICS MATERIALS AND SYNTHETIC

PLANTS

58642, 59173, 59230

PLATING AND POLISHING

58592

PLATINUM

59650

PLUME BEHAVIOR

59155, 59435, 59670, 59687

PNEUMOCONIOSIS

58286

POINT SOURCES

59550

POL STORAGE

58798

POLAND

58141, 58389, 58715, 59001, 59520, 59523, 59545, 59549

SUBJECT INDEX

POLYCHLORINATED BIPHENYLS
58578, 59443

POLYNUCLEAR COMPOUNDS
58641, 58739, 59135

POROSITY
58257, 58646, 58715, 58813

POTASSIUM COMPOUNDS
58653, 59593

POULTRY
59178

POWER CYCLES
58109, 59243, 59267, 59446

PRECIPITATION
58904

PRIMARY SMELTING AND REFINING OF NONFERROUS
58127, 58148, 58290, 58423, 58572, 58868, 59204, 59222, 59362, 59554

PRINTING AND PUBLISHING
59163, 59499, 59508

PROCESS MODIFICATION
58111, 58113, 58116, 58120, 58121, 58127, 58156, 58171, 58175, 58179, 58194, 58196, 58201, 58203, 58204, 58205, 58212, 58220, 58223, 58245, 58262, 58274, 58281, 58283, 58286, 58288, 58307, 58340, 58364, 58365, 58397, 58401, 58423, 58433, 58437, 58447, 58448, 58463, 58466, 58475, 58477, 58489, 58491, 58492, 58500, 58503, 58506, 58507, 58510, 58511, 58514, 58525, 58541, 58545, 58547, 58548, 58549, 58551, 58557, 58559, 58561, 58567, 58577, 58582, 58583, 58589, 58592, 58618, 58623, 58628, 58653, 58659, 58664, 58670, 58672, 58677, 58684, 58720, 58725, 58728, 58737, 58749, 58751, 58755, 58772, 58777, 58779, 58784, 58789, 58808, 58810, 58811, 58812, 58830, 58841, 58843, 58844, 58845, 58856, 58859, 58877, 58884, 58887, 58890, 58900, 58904, 58907, 58910, 58913, 58918, 58926, 58929, 58935, 58936, 58954, 58955, 58966, 58983, 58993, 58998, 59004, 59009, 59011, 59015, 59027, 59029, 59030, 59033, 59046, 59048, 59050, 59062, 59066, 59076, 59077, 59091, 59107, 59110, 59116, 59129, 59137, 59150, 59157, 59180, 59184, 59189, 59192, 59194, 59202, 59206, 59221, 59226, 59229, 59237, 59248, 59250, 59260, 59299, 59306, 59307, 59308, 59318, 59330, 59346, 59353, 59360, 59366, 59369, 59377, 59402, 59424, 59429, 59441, 59455, 59477, 59490, 59512, 59518, 59531, 59534, 59536, 59538, 59540, 59552, 59553, 59564, 59573, 59580, 59598, 59603, 59604, 59606, 59610, 59617, 59623, 59636, 59637, 59641, 59654, 59655, 59658, 59669, 59671, 59678, 59679, 59684, 59690, 59695, 59701, 59704, 59706

PROPANES
58158, 59152, 59445, 59571

PROPENES
58695

PROTECTANTS
58419, 58584

PROTECTIVE MASKS
59643

PUBLIC AFFAIRS
59655

PULP MILLS
58295, 58329, 58808, 58814, 58900, 58925, 59189, 59309, 59364, 59425, 59449, 59491, 59528, 59558, 59580, 59608, 59613, 59615, 59617, 59655, 59700

PULVERIZED FUELS
58612, 58751, 59512, 59668, 59675

PYRIDINES
58188, 59074, 59415

PYROLYSIS
58269, 58369, 58434, 58435, 58556, 58695, 58878, 59080, 59109, 59117, 59135, 59155, 59344, 59408, 59582

Q

QUENCHING
58855, 59192, 59223

QUESTIONNAIRES
59653

R

RADIOACTIVE RADIATION
59093, 59472, 59631

RAILROAD VEHICLES
59563

RANKINE CYCLE ENGINES
58292, 58573, 59004, 59074, 59147, 59412, 59480, 59513, 59531, 59566, 59570

RAPPING
58949, 59001, 59068, 59126, 59398, 59421, 59595

REACTION KINETICS
58160, 58250, 58337, 58352, 58426, 58458, 58488, 58630, 58642, 58652, 58828, 58883, 58905, 58906, 59069, 59122, 59180, 59264, 59309, 59314, 59351, 59378, 59393, 59411, 59447, 59467, 59482, 59507, 59512, 59517, 59533, 59562, 59565, 59626, 59635, 59647, 59650, 59666

REACTION MECHANISMS
58337, 58590, 58644, 58906, 59138, 59180, 59393, 59399, 59447, 59467, 59507, 59512, 59536, 59562, 59565, 59610, 59626, 59630, 59663, 59676

REACTORS (NUCLEAR)
58933, 59577, 59589, 59686

RECIRCULATION
58121, 58179, 58196, 58217, 58223, 58292, 58301, 58331, 58332, 58348, 58377, 58382, 58397, 58401, 58491, 58500, 58501, 58506, 58507, 58537, 58548, 58557, 58561, 58562, 58566, 58570, 58577, 58579, 58590, 58613, 58670, 58720, 58774, 58779, 58783, 58811, 58823, 58840, 58843, 58847, 58856, 58859, 58871, 58873, 58874, 58899, 58922, 58946, 58968, 58993, 59048, 59073, 59110, 59129, 59137, 59143, 59149, 59153, 59164, 59168, 59174, 59181, 59223, 59236, 59250, 59257, 59273, 59310, 59331, 59350, 59426, 59442, 59455, 59501, 59502, 59531, 59536

RECORDING METHODS
58309, 58800

REDUCTION
58188, 58248, 58250, 58272, 58292, 58293, 58294, 58343, 58438, 58439, 58558, 58594, 58625, 58645, 58646, 58656, 58688, 58689, 58776, 58779, 58841, 58849, 58867, 58880, 58896, 58906, 58926, 58939, 58956, 58969, 59087, 59091, 59118, 59120, 59141, 59210, 59254, 59263, 59304, 59338, 59378, 59386, 59406, 59409, 59447, 59455, 59464, 59478, 59505, 59571, 59614

REDUCTION TO ELEMENTS
59304, 59431

REFRACTORIES
59307

RUBBER PRODUCTION

REFUSE SYSTEMS

58128, 58142, 58144, 58204, 58210, 58211, 58218, 58246, 58247, 58269, 58296, 58297, 58309, 58323, 58346, 58347, 58364, 58365, 58374, 58381, 58424, 58434, 58435, 58455, 58546, 58553, 58556, 58557, 58582, 58612, 58665, 58671, 58676, 58704, 58728, 58731, 58732, 58878, 58913, 58950, 58960, 58969, 58972, 59000, 59010, 59051, 59062, 59089, 59109, 59150, 59155, 59219, 59227, 59274, 59307, 59324, 59328, 59333, 59344, 59366, 59373, 59408, 59415, 59425, 59434, 59443, 59474, 59501, 59558, 59560, 59579, 59582, 59602, 59606, 59617, 59641, 59684, 59698, 59699

REGULATIONS

58107, 58225, 58592, 58674, 59217, 59489, 59682

RENDERING PLANTS, GREASE AND TALLOW

58174, 58861, 58890, 59059, 59067, 59178, 59450

RESEARCH METHODOLOGIES

59585

RESEARCH PROGRAMS

58107, 58157, 59130, 59270, 59455, 59487, 59518, 59547, 59670, 59687

RESIDENTIAL AREAS

59253, 59365, 59559

RESIDENTIAL BUILDINGS

59252, 59253

RESIDENTIAL INCINERATORS

58297, 59474

RESIDENTIAL SOURCES

58347

RESIDUAL OILS

58106, 58107, 58276, 58357, 58724, 58860, 58884, 58895, 59132, 59154, 59267, 59517, 59602, 59645, 59671

RESPIRATORY DISEASES

58286, 58324

RETAIL TRADE

58302, 58315, 58326, 58327, 58344, 58375, 58651, 58713, 59005, 59039, 59094, 59098, 59134, 59145, 59185, 59306

RETENTION

59063

ROADS

58445, 58676, 59489, 59681

ROMANIA

59528

ROTARY COMBUSTION ENGINES

58503, 58616, 58672

ROTARY ENGINES

58792, 58431, 58447, 58503, 58537, 58564, 58567, 58585, 58590, 58593, 58615, 58616, 58672, 58729, 58823, 58824, 59004, 59016, 59072, 59169, 59175, 59502, 59570, 59664, 59682

ROTARY PISTON ENGINES

58292, 58431, 58537, 58564, 58567, 58585, 58590, 58593, 59016, 59169, 59570, 59664, 59682

RUBBER

58153, 59150, 59602

RUBBER AND MISCELLANEOUS PLASTICS

PRODUC

59617

RUBBER PRODUCTION

59617

RUNNING EVAPORATIVE LOSSES

RUNNING EVAPORATIVE LOSSES

58772

RURAL AREAS

58978, 59222

S

SAFETY

58117, 58222, 58303, 58735, 58835, 58957, 59023, 59094, 59458, 59480

SAFETY EQUIPMENT

58117, 58673, 59664, 59689

SAMPLERS

59451, 59618

SANITARY SERVICES

58128, 58142, 58144, 58176, 58204, 58210, 58211, 58218, 58239, 58246, 58247, 58269, 58296, 58297, 58309, 58323, 58346, 58347, 58364, 58365, 58374, 58381, 58424, 58434, 58435, 58527, 58545, 58546, 58553, 58556, 58557, 58582, 58612, 58665, 58671, 58676, 58704, 58728, 58731, 58732, 58878, 58912, 58913, 58950, 58960, 58969, 58970, 58972, 59000, 59010, 59051, 59062, 59089, 59109, 59150, 59155, 59178, 59219, 59220, 59227, 59256, 59274, 59307, 59324, 59326, 59328, 59333, 59343, 59344, 59365, 59366, 59373, 59396, 59408, 59415, 59425, 59434, 59443, 59449, 59474, 59494, 59496, 59499, 59501, 59539, 59558, 59560, 59579, 59582, 59602, 59606, 59617, 59641, 59684, 59698, 59699

SATELLITES (ARTIFICIAL)

59161

SCALING

58231, 58415, 58532, 58579, 58589, 59171, 59269, 59435, 59492

SCANDINAVIA

58202, 58209, 58286, 58341, 58454, 58497, 58515, 58545, 58625, 58637, 58731, 58861, 58925, 58927, 59059, 59189, 59298, 59316, 59421, 59540, 59644, 59677, 59678, 59679

SCREEN FILTERS

59685, 59700

SCUBBERS

58102, 58107, 58114, 58119, 58123, 58133, 58147, 58148, 58153, 58164, 58166, 58174, 58183, 58184, 58202, 58208, 58210, 58211, 58215, 58232, 58244, 58252, 58254, 58271, 58298, 58300, 58308, 58333, 58334, 58335, 58341, 58346, 58352, 58367, 58373, 58374, 58377, 58383, 58395, 58396, 58398, 58411, 58412, 58414, 58415, 58416, 58418, 58424, 58445, 58479, 58486, 58490, 58494, 58495, 58499, 58511, 58530, 58532, 58571, 58572, 58578, 58579, 58589, 58596, 58598, 58599, 58600, 58601, 58602, 58603, 58604, 58605, 58606, 58607, 58617, 58621, 58632, 58636, 58638, 58662, 58664, 58668, 58676, 58678, 58681, 58682, 58683, 58691, 58700, 58702, 58705, 58710, 58733, 58741, 58743, 58753, 58793, 58799, 58808, 58821, 58828, 58835, 58842, 58864, 58868, 58879, 58890, 58891, 58901, 58902, 58905, 58916, 58917, 58925, 58927, 58931, 58941, 58945, 58948, 58952, 58969, 58978, 58981, 58983, 58986, 58997, 59006, 59024, 59025, 59035, 59037, 59041, 59059, 59067, 59095, 59096, 59118, 59121, 59136, 59159, 59162, 59165, 59167, 59171, 59178, 59183, 59190, 59192, 59193, 59199, 59200, 59201, 59212, 59227, 59239, 59258, 59264, 59269, 59270, 59271, 59276, 59290, 59293, 59298, 59299, 59302, 59303, 59307, 59308, 59324, 59326, 59341, 59343, 59344, 59348, 59357, 59358, 59362, 59366, 59368, 59369, 59380, 59385, 59388, 59390, 59416, 59425, 59450, 59456, 59458, 59460, 59461, 59463, 59465, 59471, 59477, 59481, 59482,

59483, 59486, 59491, 59492, 59495, 59503, 59506, 59509, 59510, 59522, 59524, 59526, 59528, 59540, 59554, 59558, 59567, 59573, 59575, 59579, 59583, 59588, 59599, 59605, 59608, 59609, 59611, 59613, 59617, 59622, 59629, 59632, 59636, 59638, 59640, 59641, 59644, 59648, 59655, 59657, 59661, 59662, 59669, 59672, 59673, 59676, 59684, 59697, 59699, 59700, 59702, 59703, 59705, 59706

SEALING COMPOUNDS

58676

SEALS

59613

SECONDARY AIR

58475, 58500, 58548, 58845, 59077, 59107, 59110, 59250, 59260, 59455, 59641, 59678

SECONDARY SMELTING AND REFINING OF NONFE

58868

SEDIMENTATION (CONTROL)

58658

SEDIMENTATION PHENOMENA

59463, 59627

SELENIUM COMPOUNDS

58641, 59593

SERVICE INDUSTRIES

58457, 59056

SETTLING CHAMBERS

59307, 59465, 59579, 59636

SETTLING PARTICLES

58108, 58139, 58141, 58145, 58146, 58147, 58155, 58161, 58166, 58170, 58184, 58185, 58195, 58203, 58206, 58215, 58216, 58219, 58221, 58230, 58239, 58240, 58254, 58255, 58275, 58279, 58299, 58303, 58321, 58322, 58323, 58325, 58354, 58355, 58359, 58369, 58374, 58377, 58395, 58435, 58443, 58480, 58481, 58490, 58495, 58502, 58504, 58507, 58514, 58530, 58535, 58542, 58548, 58559, 58574, 58586, 58589, 58592, 58595, 58597, 58610, 58617, 58618, 58620, 58625, 58632, 58637, 58668, 58670, 58680, 58681, 58682, 58683, 58691, 58701, 58705, 58717, 58728, 58733, 58734, 58743, 58759, 58760, 58768, 58775, 58777, 58778, 58781, 58782, 58816, 58831, 58832, 58868, 58876, 58877, 58879, 58886, 58892, 58918, 58923, 58925, 58927, 58935, 58939, 58940, 58944, 58953, 58969, 58982, 58997, 59006, 59019, 59022, 59025, 59035, 59043, 59073, 59079, 59084, 59095, 59096, 59109, 59114, 59115, 59118, 59121, 59126, 59131, 59139, 59140, 59172, 59193, 59200, 59203, 59220, 59225, 59234, 59235, 59239, 59247, 59265, 59266, 59268, 59271, 59272, 59287, 59290, 59293, 59299, 59307, 59323, 59334, 59370, 59376, 59380, 59381, 59388, 59404, 59417, 59418, 59420, 59421, 59423, 59424, 59427, 59435, 59448, 59473, 59490, 59504, 59506, 59514, 59515, 59526, 59534, 59540, 59542, 59559, 59564, 59579, 59590, 59591, 59595, 59597, 59601, 59604, 59605, 59623, 59627, 59634, 59636, 59643, 59652, 59653, 59657, 59668, 59670, 59671, 59672, 59674, 59675, 59693, 59695, 59696, 59697, 59702, 59704, 59706

SEWAGE TREATMENT

58176, 58364, 58527, 59256, 59343, 59365, 59396, 59415, 59425, 59449, 59494, 59496, 59499, 59539

SEWERAGE SYSTEMS

58176, 58239, 58364, 58365, 58381, 58527, 58676, 58912, 58970, 59178, 59220, 59256, 59326, 59343, 59344, 59365, 59373, 59396, 59415, 59425, 59434, 59443, 59449, 59494, 59496, 59499, 59539, 59560, 59698, 59699

AIR POLLUTION ABSTRACTS, JUNE 1976

SEWERS

58364

SHALE OIL

58150, 58151, 58274, 58281, 58287, 59352

SIEVE PLATE TOWERS

59171

SILICATES

58218

SILICON COMPOUNDS

58163, 58218, 58775, 58879, 59593, 59626

SILICON DIOXIDE

59103, 59529, 59637

SILICOSIS

58286

SIMULATION

58270, 58353, 58361, 58568, 58590, 58667, 59105, 59550, 59594, 59615, 59638

SINTERING

58181, 58185, 58203, 58311, 58449, 58450, 58922, 59105, 59235, 59423, 59435, 59522, 59564, 59604, 59607

SLAUGHTERING PLANTS

58417, 59385

SLUDGE

58239, 58364, 58676, 58912, 58970, 59178, 59220, 59326, 59344, 59373, 59434, 59443, 59539, 59698, 59699

SLUDGE INCINERATORS

58913, 59324, 59443

SMOG

58198, 59306, 59479, 59642

SMOKEMETERS

58403, 59618

SMOKES

58108, 58121, 58163, 58184, 58204, 58273, 58277, 58287, 58403, 58406, 58407, 58448, 58481, 58653, 58654, 58666, 58677, 58705, 58713, 58742, 58754, 58762, 58777, 58802, 58837, 58913, 58943, 58958, 59020, 59099, 59150, 59152, 59166, 59192, 59207, 59219, 59257, 59288, 59293, 59424, 59453, 59474, 59547, 59556, 59612, 59617, 59664, 59681, 59692, 59697, 59698, 59701

SOCIO-ECONOMIC FACTORS

58150, 58151, 58345, 58767, 58983, 59258, 59487, 59488, 59535, 59550

SODIUM CARBONATE

59621

SODIUM CHLORIDE

58144, 59643

SODIUM COMPOUNDS

58144, 58655, 59599, 59621, 59643, 59655, 59662, 59700

SODIUM HYDROXIDE

59662

SODIUM PROCESSES

58122, 58134, 58229, 58411, 58412, 59201, 59270, 59357

SODIUM SULFITE

59599

SOILS

58296, 59272

SOLAR POWER

58150, 58151, 58400, 59161, 59305

SOLAR RADIATION

59487, 59686

SUBJECT INDEX

SOLID WASTE FUELS

58150, 58151, 58269, 58283, 58435, 58556,
58582, 58665, 58859, 58969, 59062, 59089

SOLUBILITY

58905, 59031, 59458

SOLVENT REFINING

58330, 58554, 59135, 59352, 59616

SOLVENTS

58120, 58251, 58457, 58648, 58674, 58838,
58945, 58982, 59050, 59163, 59298, 59321,
59413, 59493, 59508, 59569, 59606, 59624,
59698

SONIC AGGLOMERATORS

59026

SOOT

58106, 58184, 58230, 58275, 58323, 58435,
58507, 58548, 58559, 58625, 58670, 58701,
58717, 58728, 58777, 58778, 58868, 58892,
58935, 58982, 59114, 59118, 59287, 59334,
59636, 59643, 59671, 59695

SOUND

58129, 58499, 58669, 58715, 58833, 59026

SOURCE MONITORING

58186, 58242, 58304, 58521, 58641, 58798,
58920, 58973, 59020, 59186, 59288, 59494

SOUTH AFRICA

58275

SOUTH PACIFIC

58337, 58339, 58364, 58397, 58421, 58423,
58727, 58748, 58802, 58805, 58918, 58938,
58971, 59163, 59186, 59471, 59485, 59583

SOX CONTROL

58106, 58110, 58114, 58115, 58119, 58122,
58130, 58133, 58134, 58136, 58139, 58148,
58149, 58152, 58154, 58157, 58160, 58167,
58169, 58170, 58173, 58183, 58184, 58199,
58202, 58208, 58214, 58215, 58228, 58229,
58230, 58231, 58232, 58248, 58259, 58264,
58267, 58284, 58289, 58291, 58298, 58308,
58311, 58330, 58341, 58353, 58356, 58367,
58373, 58389, 58394, 58411, 58412, 58413,
58415, 58418, 58449, 58461, 58485, 58486,
58494, 58495, 58517, 58524, 58530, 58531,
58532, 58535, 58571, 58572, 58591, 58598,
58599, 58600, 58601, 58602, 58603, 58604,
58605, 58606, 58608, 58609, 58618, 58620,
58632, 58636, 58640, 58644, 58655, 58658,
58659, 58667, 58668, 58676, 58678, 58681,
58682, 58683, 58690, 58691, 58699, 58705,
58711, 58716, 58717, 58719, 58744, 58750,
58756, 58765, 58785, 58793, 58813, 58820,
58828, 58835, 58842, 58862, 58863, 58864,
58866, 58867, 58868, 58882, 58883, 58936,
58941, 58963, 58964, 58973, 58981, 58983,
58989, 58990, 58997, 59003, 59031, 59041,
59045, 59057, 59058, 59069, 59076, 59082,
59085, 59092, 59113, 59118, 59119, 59121,
59123, 59165, 59168, 59170, 59171, 59177,
59179, 59191, 59201, 59204, 59211, 59212,
59213, 59222, 59235, 59238, 59254, 59264,
59268, 59269, 59270, 59271, 59275, 59276,
59291, 59292, 59299, 59304, 59314, 59316,
59319, 59326, 59327, 59329, 59331, 59338,
59341, 59346, 59348, 59352, 59353, 59357,
59363, 59389, 59394, 59397, 59405, 59431,
59438, 59444, 59452, 59459, 59466, 59467,
59477, 59481, 59486, 59492, 59495, 59503,
59510, 59522, 59546, 59549, 59567, 59581,
59585, 59588, 59592, 59596, 59599, 59601,
59610, 59616, 59619, 59620, 59621, 59622,
59623, 59629, 59630, 59633, 59636, 59640,
59650, 59659, 59662, 59667, 59670, 59687

SPACE HEATING

58121, 58749

SPAIN

58822

SPARK IGNITION ENGINES

58270, 58390, 58466, 58562, 58590, 58633,
58762, 58935, 59146, 59202, 59206, 59273,
59371, 59502, 59538, 59552, 59566, 59570,
59594, 59628, 59682

SPARK TIMING

58162, 58307, 58385, 58390, 58476, 58534,
58590, 58686, 58787, 59047, 59229, 59273,
59277, 59283, 59426, 59557, 59594, 59628

SPECTROPHOTOMETRY

58855, 59192, 59223

SPRAY TOWERS

58398, 58415, 58495, 58879, 58916, 58952,
58997, 59059, 59067, 59269, 59293, 59380,
59416, 59483, 59492, 59524, 59526, 59528,
59558, 59638, 59684, 59697, 59702

SPRAYS

58617, 58618, 59299, 59702

ST LOUIS

58546

STABILITY (ATMOSPHERIC)

58151, 59325

STACK DIAMETER

59325

STACK GASES

58106, 58107, 58109, 58114, 58116, 58121,
58122, 58123, 58129, 58131, 58133, 58134,
58139, 58149, 58152, 58153, 58157, 58161,
58164, 58167, 58169, 58170, 58173, 58176,
58184, 58196, 58197, 58199, 58202, 58208,
58215, 58219, 58220, 58227, 58228, 58232,
58248, 58250, 58253, 58261, 58264, 58275,
58281, 58284, 58289, 58298, 58311, 58316,
58328, 58330, 58341, 58350, 58353, 58367,
58373, 58374, 58384, 58387, 58394, 58395,
58404, 58411, 58412, 58415, 58416, 58418,
58424, 58427, 58438, 58449, 58450, 58464,
58486, 58490, 58495, 58530, 58531, 58543,
58547, 58553, 58557, 58571, 58578, 58579,
58580, 58587, 58591, 58594, 58598, 58599,
58600, 58601, 58602, 58603, 58604, 58605,
58606, 58620, 58621, 58626, 58640, 58644,
58658, 58662, 58667, 58668, 58678, 58681,
58682, 58683, 58690, 58691, 58700, 58716,
58717, 58719, 58727, 58730, 58733, 58742,
58744, 58760, 58768, 58770, 58785, 58788,
58795, 58798, 58800, 58803, 58811, 58813,
58821, 58828, 58837, 58842, 58855, 58856,
58862, 58863, 58866, 58867, 58868, 58878,
58891, 58905, 58936, 58940, 58941, 58963,
58969, 58978, 58983, 58989, 58990, 58997,
59003, 59029, 59030, 59035, 59046, 59073,
59086, 59089, 59097, 59112, 59114, 59118,
59121, 59123, 59138, 59159, 59164, 59165,
59168, 59171, 59211, 59223, 59234, 59235,
59251, 59254, 59264, 59268, 59271, 59275,
59276, 59287, 59291, 59292, 59293, 59295,
59304, 59319, 59323, 59329, 59334, 59337,
59341, 59353, 59358, 59361, 59363, 59390,
59405, 59411, 59416, 59428, 59438, 59443,
59444, 59452, 59461, 59463, 59466, 59477,
59483, 59486, 59492, 59495, 59499, 59503,
59507, 59512, 59522, 59524, 59526, 59535,
59536, 59546, 59558, 59559, 59569, 59577,
59580, 59581, 59584, 59585, 59588, 59590,
59593, 59599, 59600, 59601, 59604, 59606,
59608, 59609, 59610, 59611, 59615, 59621,
59622, 59623, 59629, 59630, 59633, 59636,
59644, 59648, 59655, 59657, 59658, 59659,
59662, 59665, 59667, 59670, 59672, 59676,
59687, 59692, 59693, 59697, 59699, 59700,
59702, 59703, 59705

STACK HEIGHT

58275, 58319, 58664, 59162, 59165, 59200,
59325, 59524

STACK MONITORING

58242, 58304, 58798

SULFATES

STACKS

58275, 58319, 58419, 58664, 58754, 58803,
58932, 59159, 59162, 59165, 59200, 59234,
59293, 59325, 59524, 59559, 59584, 59618,
59670, 59687, 59699

STAINLESS STEEL

58939

STATE GOVERNMENTS

59052

STATISTICAL ANALYSES

59635

STEAM

58166, 58329, 58420, 58427, 58499, 58508,
58575, 59010, 59192, 59330, 59378, 59430,
59641

STEAM ELECTRIC POWER GENERATION

58101, 58109, 58111, 58112, 58114, 58132,
58143, 58150, 58161, 58167, 58242, 58247,
58304, 58313, 58330, 58384, 58389, 58397,
58414, 58416, 58455, 58486, 58552, 58591,
58598, 58599, 58600, 58601, 58602, 58603,
58604, 58605, 58606, 58608, 58609, 58639,
58690, 58716, 58727, 58767, 58805, 58835,
58863, 58865, 58878, 58887, 58900, 58930,
58933, 58983, 59003, 59010, 59058, 59092,
59162, 59258, 59267, 59272, 59275, 59289,
59292, 59305, 59326, 59337, 59357, 59466,
59510, 59535, 59560, 59588, 59622, 59629,
59633, 59670

STEAM ENGINES

58573, 59004, 59147, 59513, 59531, 59566,
59570

STEEL

58939, 59573, 59604, 59623, 59649, 59663,
59697

STEEL PRODUCTION-E

58580, 58782, 58939, 59095, 59320, 59516,
59692

STIRLING CYCLE ENGINES

58292, 58996, 59004, 59078, 59531

STONE, CLAY, GLASS, AND CONCRETE

PRODUCT

58170, 58184, 58239, 58394, 58442, 58443,
58759, 58830, 58865, 58886, 59331, 59444,
59448, 59491

STORAGE FACILITIES (BULK LIQUID)

58302, 58326, 58327, 58398, 58466, 58651,
58763, 58769, 58798, 59094, 59145, 59301,
59324

STRATIFIED CHARGE ENGINES

58162, 58234, 58292, 58307, 58360, 58372,
58474, 58510, 58622, 58633, 58672, 58984,
59081, 59149, 59209, 59281, 59288, 59371,
59453, 59502, 59566, 59570, 59598, 59682

STREETS

58445, 59489, 59681

STRUCTURES

58139, 58354, 58731, 58786, 58796, 58803,
58831, 58876, 59093, 59232, 59252, 59253,
59473, 59681, 59691

STYRENES

59396

SUBSURFACE STRUCTURES

58339, 58354

SUGAR AND CONFECTIONARY

PRODUCTS INDUSTRY

58733

SULFATES

58655, 58904, 58978, 59263, 59278, 59288,
59616, 59655, 59662, 59694, 59700

SULFATION-OF-LEAD METHODS

SULFATION-OF-LEAD METHODS
59670SULFHYDRYL COMPOUNDS
59608, 59616

SULFIDES

58115, 58127, 58209, 58218, 58224, 58226,
58248, 58257, 58259, 58296, 58306, 58308,
58350, 58364, 58413, 58430, 58482, 58485,
58487, 58488, 58511, 58516, 58524, 58611,
58617, 58619, 58620, 58621, 58696, 58769,
58808, 58862, 58890, 58973, 58977, 58981,
59023, 59037, 59044, 59045, 59053, 59079,
59085, 59091, 59109, 59117, 59125, 59135,
59170, 59178, 59189, 59191, 59256, 59267,
59301, 59304, 59316, 59327, 59329, 59351,
59364, 59365, 59394, 59396, 59405, 59415,
59425, 59430, 59431, 59432, 59450, 59459,
59482, 59496, 59507, 59533, 59565, 59567,
59586, 59596, 59608, 59615, 59616, 59621,
59629, 59630, 59650, 59655, 59663, 59680,
59685, 59703

SULFITES

58169, 58170, 58655, 59599, 59662

SULFUR COMPOUNDS

58115, 58127, 58168, 58169, 58170, 58209,
58218, 58224, 58226, 58248, 58257, 58259,
58265, 58276, 58296, 58306, 58308, 58346,
58350, 58364, 58413, 58430, 58469, 58482,
58485, 58487, 58488, 58511, 58516, 58524,
58536, 58546, 58611, 58617, 58618, 58619,
58620, 58621, 58650, 58655, 58696, 58769,
58808, 58827, 58834, 58838, 58855, 58862,
58890, 58895, 58904, 58908, 58921, 58924,
58973, 58977, 58978, 58981, 59023, 59037,
59044, 59045, 59053, 59079, 59085, 59091,
59104, 59109, 59117, 59125, 59135, 59168,
59170, 59178, 59189, 59191, 59256, 59258,
59263, 59267, 59278, 59288, 59291, 59301,
59304, 59316, 59327, 59329, 59351, 59364,
59365, 59378, 59389, 59394, 59396, 59405,
59415, 59420, 59425, 59430, 59431, 59432,
59450, 59457, 59459, 59482, 59485, 59488,
59496, 59507, 59530, 59533, 59565, 59567,
59586, 59586, 59596, 59599, 59608, 59615,
59616, 59621, 59629, 59630, 59637, 59650,
59654, 59655, 59662, 59663, 59680, 59685,
59694, 59700, 59703

SULFUR DIOXIDE

58123, 58131, 58133, 58148, 58173, 58242,
58257, 58264, 58275, 58281, 58284, 58291,
58296, 58298, 58319, 58356, 58366, 58379,
58387, 58389, 58412, 58415, 58416, 58424,
58435, 58444, 58450, 58495, 58516, 58572,
58609, 58620, 58624, 58632, 58641, 58646,
58647, 58649, 58652, 58658, 58659, 58714,
58738, 58760, 58768, 58798, 58804, 58828,
58866, 58883, 58888, 58891, 58892, 58902,
58904, 58916, 58925, 58941, 58961, 58962,
58973, 58978, 58997, 59031, 59057, 59069,
59079, 59085, 59091, 59109, 59114, 59120,
59162, 59189, 59222, 59269, 59270, 59271,
59276, 59285, 59291, 59292, 59314, 59319,
59322, 59330, 59331, 59332, 59337, 59341,
59357, 59362, 59363, 59379, 59394, 59415,
59425, 59447, 59464, 59490, 59492, 59495,
59503, 59524, 59526, 59535, 59551, 59565,
59567, 59580, 59584, 59604, 59617, 59619,
59621, 59629, 59636, 59640, 59649, 59670,
59684, 59696

SULFUR ORGANIC COMPOUNDS

58218, 58268, 58306, 58318, 58346, 58364,
58398, 58417, 58509, 58641, 58710, 58808,
59053, 59113, 59296, 59364, 59366, 59396,
59415, 59425, 59447, 59450, 59482, 59539,
59568, 59608, 59612, 59615, 59616, 59655

SULFUR OXIDES

58123, 58127, 58131, 58133, 58148, 58173,
58227, 58228, 58242, 58257, 58264, 58275,
58281, 58284, 58291, 58296, 58298, 58319,
58350, 58356, 58366, 58379, 58387, 58389,

58412, 58415, 58416, 58424, 58435, 58444,
58450, 58495, 58516, 58529, 58572, 58594,
58595, 58607, 58609, 58620, 58624, 58632,
58641, 58646, 58647, 58649, 58652, 58658,
58659, 58699, 58714, 58738, 58760, 58768,
58798, 58804, 58828, 58866, 58883, 58888,
58891, 58892, 58902, 58904, 58905, 58916,
58925, 58940, 58941, 58961, 58962, 58973,
58978, 58997, 59031, 59043, 59057, 59063,
59069, 59079, 59085, 59091, 59109, 59114,
59120, 59151, 59162, 59189, 59222, 59269,
59270, 59271, 59275, 59276, 59285, 59291,
59292, 59303, 59314, 59319, 59322, 59370,
59331, 59332, 59337, 59341, 59357, 59362,
59363, 59379, 59394, 59415, 59425, 59443,
59446, 59447, 59464, 59490, 59492, 59495,
59503, 59524, 59526, 59534, 59535, 59551,
59565, 59567, 59580, 59584, 59604, 59617,
59619, 59621, 59629, 59636, 59640, 59649,
59659, 59670, 59671, 59684, 59687, 59696

SULFUR PRODUCTION

58430, 59304

SULFUR TRIOXIDE

58275, 58389, 58435, 58444, 58595, 58804,
58916, 58961, 58962, 59114, 59271, 59303,
59524, 59526, 59534, 59621, 59629, 59636,
59659, 59671

SULFURIC ACID

58461, 58636, 58641, 58756, 58916, 59254,
59495, 59496, 59533, 59549, 59584, 59592,
59610, 59616, 59650, 59662, 59671, 59694,
59705

SULFURIC ACID PLANTS

58119, 58131, 58330, 58389, 58998, 59199,
59524, 59526

SUPERPHOSPHATE PLANTS

58190, 59524, 59526

SUPERSATURATION

58415

SURFACE COATING OPERATIONS

58120, 58679, 59163, 59463, 59491, 59499,
59508, 59606

SURFACE COATINGS

58153, 58679, 59606, 59609, 59624

SURFACE PROPERTIES

58257, 58450, 58646, 58715, 58813, 59102,
59349, 59383, 59562, 59565, 59643

SURFACTANTS

59591

SURVEY METHODS

58315, 58664, 59056

SUSPENDED PARTICULATES

58108, 58118, 58119, 58121, 58140, 58163,
58182, 58184, 58197, 58198, 58204, 58216,
58221, 58227, 58273, 58277, 58279, 58280,
58287, 58347, 58350, 58383, 58384, 58395,
58398, 58403, 58406, 58407, 58414, 58415,
58448, 58455, 58481, 58528, 58544, 58589,
58617, 58618, 58641, 58653, 58654, 58666,
58676, 58677, 58678, 58701, 58705, 58713,
58727, 58742, 58744, 58754, 58757, 58762,
58777, 58782, 58796, 58802, 58803, 58829,
58837, 58875, 58913, 58920, 58921, 58938,
58940, 58943, 58958, 58997, 59020, 59029,
59039, 59041, 59043, 59089, 59095, 59099,
59131, 59150, 59152, 59155, 59162, 59166,
59173, 59192, 59207, 59219, 59230, 59257,
59288, 59293, 59303, 59306, 59320, 59347,
59376, 59380, 59401, 59417, 59424, 59428,
59444, 59453, 59473, 59474, 59479, 59490,
59492, 59516, 59529, 59531, 59540, 59547,
59548, 59550, 59556, 59558, 59575, 59583,
59612, 59617, 59618, 59619, 59626, 59629,
59642, 59643, 59654, 59655, 59664, 59668,
59672, 59681, 59684, 59687, 59690, 59692,
59697, 59698, 59699, 59700, 59701, 59704,
59705

AIR POLLUTION ABSTRACTS, JUNE 1976

SWEDEN

58202, 58209, 58286, 58341, 58454, 58497,
58515, 58637, 58731, 58925, 58927, 59298,
59316, 59540, 59644, 59677, 59678, 59679

SWITZERLAND

58137, 58146, 58175, 58176, 58297, 58325,
58392, 58402, 58424, 58670, 58910, 58930,
59013, 59287

SYNTHESIS GAS CLEANING

58318

SYNTHETIC FIBERS

59660

SYNTHETIC NATURAL GAS (SNG)

58140, 58281, 58368, 58540, 59076, 59135,
59352, 59386

T

TABLES AND CLASSIFIERS

59322

TARS (POLLUTANTS)

58246, 58695

TEMPERATURE

58104, 58121, 58149, 58158, 58160, 58188,
58201, 58213, 58218, 58257, 58258, 58275,
58282, 58303, 58309, 58346, 58371, 58372,
58397, 58407, 58433, 58438, 58439, 58444,
58472, 58473, 58476, 58482, 58516, 58523,
58547, 58557, 58588, 58652, 58657, 58667,
58684, 58708, 58712, 58735, 58770, 58804,
58817, 58823, 58852, 58856, 58867, 58871,
58872, 58894, 58909, 58921, 58926, 58977,
58993, 59009, 59031, 59032, 59034, 59047,
59055, 59057, 59079, 59084, 59103, 59105,
59106, 59156, 59166, 59176, 59194, 59236,
59238, 59240, 59254, 59302, 59340, 59351,
59359, 59378, 59383, 59393, 59417, 59420,
59437, 59474, 59480, 59484, 59492, 59498,
59514, 59528, 59537, 59541, 59546, 59553,
59561, 59562, 59568, 59570, 59574, 59575,
59578, 59580, 59592, 59593, 59596, 59603,
59614, 59619, 59621, 59625, 59626, 59627,
59629, 59633, 59636, 59638, 59647, 59649,
59650, 59658, 59663, 59666, 59667, 59690,
59700, 59701

TEMPERATURE (ATMOSPHERIC)

58519, 59325, 59631

TEMPERATURE GRADIENT

58151

TEMPERATURE SENSING INSTRUMENTS

59474

TENNESSEE

59062

TENSILE STRENGTH

59649

TERMINOLOGY

59555

TEST ENGINES

59445, 59497, 59594, 59628, 59638

TETRAETHYL LEAD

58630, 59639

TETRAMETHYL LEAD

58214

TEXTILE MILLS

58413, 58419, 58970, 59396, 59425, 59703

TEXTILES

58206, 58717, 59660

THERMAL CONDUCTIVITY

59479

SUBJECT INDEX

THERMAL RADIATION

58800, 59631

THERMODYNAMIC PROPERTIES

59074, 59480, 59484

THERMODYNAMICS

58352, 59074, 59309, 59351, 59512, 59513, 59638, 59666

THIOPHENE

58509, 59568, 59616

THROUGHPUT

58426, 58636, 58743, 58805, 59038

TIDAL POWER

58150, 59305

TIMED FUEL INJECTION

58162, 58277, 58307, 58409, 58474, 58567, 58568, 58615, 58616, 58653, 58764, 58897, 58898, 58899, 58959, 59071, 59077, 59100, 59176, 59197, 59206, 59209, 59214, 59229, 59261, 59263, 59273, 59426, 59547, 59552, 59598, 59618, 59628, 59664

TIN COMPOUNDS

58969, 59139

TIRES

59117

TITANIUM COMPOUNDS

59643

TOKYO

58557, 58592

TOLUENES

58509, 59396, 59447, 59571, 59635, 59666

TOPOGRAPHIC INTERACTIONS

59325, 59670, 59699

TOXICITY

58934, 59023, 59306, 59461

TRACE ANALYSIS

59558

TRANSPORT

59325

TRAY TOWERS

59171, 59528

TREES

59063

TRENDS

58122, 58443, 58633, 58830, 58934, 58971, 59162, 59355, 59623, 59682, 59683, 59684, 59687

TRUCKS

59531, 59598

TUNNELS

58339, 58354

TURBOFAN ENGINES

59136

TURBOJET ENGINES

59136

TURBULENCE (ATMOSPHERIC)

59325

TURBULENCE (GENERAL)

58140, 58241, 58721, 58747, 58856, 59025, 59300

TWO-STROKE CYCLE ENGINES

58237, 58312, 58390, 58959, 59144, 59339, 59439

U

ULTRASONICS

58699, 59472, 59557

ULTRAVIOLET RADIATION

58522, 59649

UNITED KINGDOM

58191, 58200, 58212, 58283, 58346, 58380, 58388, 58587, 58786, 58891, 58909, 58928, 58943, 58955, 58958, 58978, 59005, 59066, 59130, 59158, 59209, 59294, 59317, 59380, 59395, 59499, 59500, 59504, 59525, 59527, 59540, 59541, 59561, 59572, 59607, 59652, 59675, 59703

UNITED STATES

58345, 58546, 59062, 59149, 59222, 59275, 59365, 59467, 59496

UNIVERSITIES

59130

UNLEADED GASOLINES

58310, 58391

URBAN AREAS

58345, 59489, 59585, 59618

USSR

58185, 58188, 58195, 58201, 58206, 58226, 58311, 58318, 58379, 58383, 58401, 58479, 58483, 58492, 58638, 58642, 58649, 58650, 58695, 58697, 58721, 58769, 58777, 58782, 58863, 58879, 58900, 58924, 58965, 58985, 59006, 59049, 59073, 59084, 59093, 59103, 59112, 59139, 59140, 59162, 59165, 59182, 59244, 59262, 59264, 59271, 59272, 59334, 59351, 59397, 59418, 59485, 59519, 59522, 59532, 59546, 59558, 59568, 59590, 59591, 59592, 59597, 59656, 59658, 59673

V

VANADIUM COMPOUNDS

58276, 58855, 59650

VAPOR PRESSURE

59480

VAPOR RECOVERY SYSTEMS

58302, 58315, 58326, 58327, 58344, 58375, 58470, 58518, 58651, 58706, 58763, 58946, 58957, 59094, 59134, 59145, 59163, 59185, 59286, 59313, 59508, 59654

VAPORS

58105, 58166, 58216, 58275, 58315, 58316, 58329, 58344, 58366, 58375, 58396, 58420, 58427, 58428, 58470, 58499, 58508, 58518, 58538, 58575, 58627, 58642, 58648, 58651, 58726, 58736, 58758, 58763, 58813, 58935, 58952, 58957, 58982, 59010, 59011, 59094, 59145, 59192, 59244, 59262, 59306, 59315, 59321, 59330, 59354, 59378, 59430, 59480, 59488, 59606, 59640, 59641, 59646, 59660

VARIABLE THROAT VENTURI

SCRUBBERS

58252

VELOCITY

58415, 58481, 58492, 58499, 58867, 59140, 59492

VENTILATION

58222, 58251, 58268, 58286, 58321, 58322, 58339, 58354, 58370, 58398, 58574, 58713, 58755, 58796, 58803, 58831, 59093, 59186, 59217, 59252, 59253, 59307, 59320, 59324, 59369, 59373, 59456, 59473, 59554

VENTURI SCRUBBERS

58166, 58252, 58254, 58383, 58415, 58418, 58424, 58600, 58604, 58638, 58691, 58733,

WASTE GAS CONTROL

58842, 58916, 58917, 58925, 58931, 59006, 59095, 59162, 59165, 59193, 59239, 59269, 59388, 59465, 59492, 59573, 59579, 59583, 59613, 59622, 59648, 59655, 59657, 59705

VESSELS (MARINE)

58891, 59331

VIBRATION

58975, 59001

VIRUSES

59328

VISCOSITY

58819

VISUAL PROPERTIES

58589, 58800

VOLATILITY

58191, 58688, 58935, 59313, 59375, 59386, 59558, 59635

VOLTAGE

58265, 58675, 59084, 59417, 59556, 59561, 59597

W

WASTE GAS CONTROL

58106, 58107, 58110, 58114, 58115, 58119, 58122, 58125, 58130, 58133, 58134, 58136, 58139, 58148, 58149, 58152, 58154, 58157, 58160, 58165, 58167, 58169, 58170, 58173, 58180, 58183, 58184, 58192, 58196, 58199, 58201, 58202, 58208, 58214, 58215, 58221, 58224, 58226, 58228, 58229, 58230, 58231, 58232, 58236, 58244, 58248, 58250, 58259, 58264, 58267, 58272, 58275, 58284, 58289, 58290, 58291, 58298, 58307, 58308, 58311, 58328, 58330, 58341, 58343, 58353, 58356, 58362, 58367, 58373, 58379, 58389, 58394, 58410, 58411, 58412, 58413, 58415, 58418, 58430, 58438, 58449, 58450, 58458, 58459, 58461, 58462, 58485, 58486, 58490, 58494, 58495, 58516, 58517, 58524, 58529, 58530, 58531, 58532, 58537, 58555, 58557, 58561, 58570, 58571, 58572, 58580, 58583, 58591, 58594, 58598, 58599, 58600, 58601, 58602, 58603, 58604, 58605, 58606, 58608, 58609, 58611, 58618, 58620, 58632, 58636, 58638, 58640, 58644, 58655, 58657, 58658, 58659, 58662, 58667, 58668, 58674, 58676, 58678, 58681, 58682, 58683, 58684, 58686, 58689, 58690, 58691, 58699, 58705, 58708, 58709, 58711, 58716, 58717, 58719, 58720, 58725, 58730, 58733, 58744, 58750, 58753, 58756, 58765, 58769, 58776, 58779, 58785, 58793, 58799, 58813, 58820, 58828, 58835, 58837, 58842, 58843, 58849, 58862, 58863, 58864, 58866, 58867, 58868, 58880, 58882, 58883, 58905, 58906, 58936, 58941, 58945, 58956, 58963, 58964, 58973, 58981, 58983, 58989, 58990, 58993, 58997, 59003, 59031, 59041, 59045, 59046, 59049, 59053, 59057, 59058, 59069, 59076, 59077, 59082, 59085, 59087, 59092, 59105, 59106, 59113, 59114, 59118, 59119, 59121, 59122, 59123, 59129, 59138, 59148, 59165, 59168, 59169, 59170, 59171, 59177, 59178, 59179, 59191, 59198, 59199, 59201, 59202, 59204, 59210, 59211, 59212, 59213, 59222, 59235, 59236, 59238, 59246, 59254, 59256, 59260, 59264, 59268, 59269, 59270, 59271, 59273, 59275, 59276, 59291, 59292, 59294, 59299, 59303, 59304, 59314, 59316, 59319, 59326, 59327, 59329, 59331, 59338, 59340, 59341, 59342, 59346, 59348, 59351, 59352, 59353, 59357, 59360, 59363, 59389, 59390, 59391, 59394, 59397, 59399, 59405, 59426, 59431, 59436, 59438, 59439, 59444, 59452, 59459, 59461, 59466, 59467, 59477, 59481, 59486, 59492, 59495, 59503, 59510, 59522, 59533, 59536, 59546, 59549, 59553, 59567, 59581, 59585, 59586, 59588, 59592, 59596, 59599, 59601, 59610, 59616,

WASTE GASES

59619, 59620, 59621, 59622, 59623, 59629,
59630, 59633, 59636, 59640, 59650, 59659,
59662, 59667, 59670, 59673, 59687

WASTE GASES

58105, 58106, 58107, 58109, 58111, 58114,
58116, 58117, 58119, 58121, 58122, 58123,
58129, 58131, 58133, 58134, 58138, 58139,
58148, 58149, 58152, 58153, 58157, 58161,
58164, 58166, 58167, 58169, 58170, 58173,
58176, 58180, 58184, 58190, 58192, 58196,
58197, 58199, 58202, 58205, 58208, 58215,
58219, 58220, 58224, 58227, 58228, 58232,
58236, 58245, 58246, 58248, 58250, 58253,
58260, 58261, 58262, 58264, 58267, 58275,
58281, 58284, 58289, 58290, 58291, 58298,
58305, 58308, 58311, 58316, 58328, 58330,
58335, 58341, 58343, 58346, 58350, 58352,
58353, 58360, 58362, 58364, 58366, 58367,
58373, 58374, 58376, 58379, 58380, 58384,
58386, 58387, 58388, 58394, 58395, 58397,
58398, 58404, 58411, 58412, 58413, 58415,
58416, 58417, 58418, 58423, 58424, 58427,
58430, 58434, 58435, 58436, 58438, 58444,
58449, 58450, 58460, 58462, 58464, 58468,
58479, 58485, 58486, 58487, 58490, 58492,
58495, 58502, 58504, 58507, 58511, 58512,
58516, 58517, 58526, 58529, 58530, 58531,
58543, 58547, 58553, 58557, 58558, 58561,
58571, 58578, 58579, 58580, 58583, 58587,
58591, 58594, 58595, 58596, 58598, 58599,
58600, 58601, 58602, 58603, 58604, 58605,
58606, 58611, 58618, 58619, 58620, 58621,
58624, 58626, 58632, 58636, 58640, 58641,
58642, 58643, 58644, 58649, 58657, 58658,
58659, 58662, 58666, 58667, 58668, 58676,
58678, 58679, 58681, 58682, 58683, 58686,
58687, 58690, 58691, 58700, 58702, 58705,
58716, 58717, 58719, 58720, 58721, 58727,
58730, 58733, 58741, 58742, 58743, 58744,
58746, 58756, 58759, 58760, 58768, 58769,
58770, 58777, 58779, 58782, 58785, 58788,
58793, 58795, 58798, 58799, 58800, 58803,
58808, 58811, 58813, 58821, 58828, 58833,
58837, 58842, 58855, 58856, 58859, 58862,
58863, 58864, 58866, 58867, 58868, 58878,
58891, 58892, 58901, 58905, 58907, 58913,
58925, 58927, 58931, 58932, 58936, 58940,
58941, 58943, 58945, 58948, 58950, 58955,
58956, 58957, 58958, 58962, 58963, 58965,
58969, 58973, 58978, 58981, 58982, 58983,
58989, 58990, 58992, 58997, 59003, 59011,
59020, 59024, 59029, 59030, 59031, 59035,
59038, 59041, 59044, 59045, 59046, 59053,

AIR POLLUTION ABSTRACTS, JUNE 1976

59061, 59073, 59079, 59085, 59086, 59089,
59092, 59096, 59097, 59105, 59109, 59112,
59114, 59118, 59121, 59123, 59125, 59138,
59141, 59159, 59164, 59165, 59167, 59168,
59171, 59177, 59190, 59198, 59200, 59201,
59204, 59205, 59211, 59213, 59223, 59224,
59227, 59228, 59234, 59235, 59238, 59239,
59243, 59251, 59254, 59264, 59268, 59269,
59271, 59275, 59276, 59287, 59291, 59292,
59293, 59295, 59304, 59307, 59309, 59314,
59315, 59316, 59318, 59319, 59323, 59324,
59327, 59329, 59330, 59334, 59337, 59338,
59341, 59343, 59351, 59352, 59353, 59358,
59360, 59361, 59362, 59363, 59380, 59382,
59390, 59391, 59394, 59399, 59401, 59405,
59411, 59416, 59417, 59418, 59425, 59428,
59430, 59432, 59433, 59435, 59438, 59440,
59443, 59444, 59446, 59452, 59461, 59463,
59466, 59469, 59470, 59471, 59477, 59483,
59486, 59491, 59492, 59495, 59499, 59503,
59506, 59507, 59510, 59512, 59514, 59520,
59521, 59522, 59524, 59525, 59526, 59529,
59532, 59533, 59535, 59536, 59542, 59546,
59554, 59558, 59559, 59567, 59569, 59577,
59580, 59581, 59584, 59585, 59588, 59590,
59593, 59599, 59600, 59601, 59604, 59606,
59608, 59609, 59610, 59611, 59615, 59621,
59622, 59623, 59629, 59630, 59633, 59636,
59644, 59648, 59655, 59657, 59658, 59659,
59662, 59665, 59667, 59670, 59672, 59673,
59676, 59687, 59692, 59693, 59696, 59697,
59699, 59700, 59702, 59703, 59705

WATER

58350, 58443, 58454, 58649, 58882, 59031,
59074, 59091, 59109, 59136, 59389, 59435,
59591, 59685, 59702

WATER BODIES

58176, 58374, 58449, 59377, 59560, 59660,
59665

WATER POLLUTION

58176, 58374, 58449, 59377, 59560, 59660,
59665

WATER VAPOR

58166, 58216, 58275, 58366, 58813, 59315

WEATHER MODIFICATION

58519

WELLMAN LORD PROCESS

58122, 58148, 58157, 58330, 59003

WEST AND GAEKE METHOD (SO2)

59670

WET CYCLONES

58147, 58499, 58638, 58741, 58952, 59526,
59699

WETTING

58123, 58195, 58442, 58617, 58620, 59307,
59541, 59563, 59627

WIND POWER

58150, 58151

WINDS

59325, 59565, 59699

WOOD (MATERIAL)

59560

WOOD FUELS

58151

X

XYLENES

59571

Y

YUGOSLAVIA

58502, 59051, 59429

Z

ZEOLITES

58813

ZINC

59704

ZINC COMPOUNDS

58969, 59222, 59370, 59423, 59435, 59530,
59549, 59627, 59693

ZINC OXIDES

58940

ZINC PRIMARY SMELTING AND

REFINING

58572, 59204

AUTHOR INDEX

A

ABASEEV V K *58188
 ABE T 58884
 ABELLO L *58189
 ABOWD R G JR *59612
 ABSHER L R *59293
 ACHORN F P *58190
 ACRES G J K *58191, *59294
 ADACHI K 58780
 ADACHI N *58192, *59556
 ADAMS L M *58193
 ADELMAN H G *58194
 AFANAS E V I I *58195
 AGARWAL M R *59295
 AGHASSI W J *58196
 AHMAN S 58341
 AHMED B 59305
 AHUJA R D *58197
 AINE H E *58198
 AKHTAR S *59296
 AKIYAMA Y 59148
 ALBRECHT P F *58199
 ALCOCK L *58200
 ALEFELD G *58101
 ALEKHOVICH A N *58201
 ALFREDSSON P O *58202
 ALLAIN R J 58586
 ALLEN J E *58203
 ALLEN T D 59443
 ALTEKRUSE R D *58204
 ALTMAN J G 58859
 ALTMANN B G *58205
 AMANN C A 58361
 AMERKHAPOV R A *58206
 AN NEN Y 59120
 ANANTH K P *58102, *58103, *58104
 ANASTAS M Y *58105, 58356
 ANDERAU B 58144
 ANDERSON C D *58207
 ANDERSON D M 59617
 ANDERSON R E *58208
 ANDERSON W L *59297
 ANDERSSON P E *58209
 ANDO J *58106, *58107
 ANDO M 59122
 ANDO R 59105
 ANDREASSON S *59298
 ANKERSEN B R *58210, *58211
 ANSDALE R F K *58212
 ANTUNES G E 58582
 AOI K *58213
 AOIT *58214
 AOKI T *58215
 AOYAMA H 58908
 AOYAMA M *58216
 APOSTOLESU N *58108
 AQUINO C F *58217
 ARAI K 59133
 ARAI S 58812, 58889
 ARAKI K *58218
 ARCHER D H 58659
 ARIAKE S *58219
 ARKHIPOV A V 58195
 ARMENTO W J *58220

ARNAUD J L 59201
 ARNOLD H G 59305
 ARNOLD J P *59497
 ARNOLD O M *58221
 ARONOV E V 58649
 ARVIDSON J M *58222
 ARVIN J R *58223
 ASAKAWA C 58608, 58609
 ASAKAWA T 58869
 ASANAGI E *58224
 ASHIHARA K *58225
 ASTAKHOV V A *58226
 ATAGO T 59107
 ATHERTON L F *58109
 ATKINS R S *58227
 ATSUKAWA M *58110, *58228, *58229, *58230, *58231
 ATWOOD G R *58232
 AUGUST P *58233
 AUSTIN T C *59557
 AVERS C E *59299
 AYERS K C 58329
 AYRES J R 59540

B

BABASHKINA T I 58483
 BACHMAN K C *58234
 BACHMANN W V *58235
 BACZEWSKI K C 58432
 BADHWAR K K *58236
 BAILEY D H 58238
 BAILEY H E *58237, *58238
 BAILEY R E 58238
 BALSLEY R L 58563
 BAKER A F 59322
 BAKER D E *58239
 BAKHAREVA Y N 58721
 BALABANOV V P 59156
 BALAY H L 58190
 BALDWIN R M 58797
 BALL F J 59319
 BALLA P A *58240
 BALLANTYNE W E 58356
 BALLUFF R N *58241, 58446, *59300
 BANSE D *58242
 BARBER E C *59301
 BARBER E M *58243
 BARBER J C *58244, *59672
 BARNES T M *58245
 BARNISKE L *58246, *58247
 BARON G *59302
 BARRETT R E 58749
 BARRON A V JR *59613
 BARTH H J 58632
 BARTHEL Y *58248, *59303, *59304
 BARUAH P C 58270
 BARYSHEV V I *59558
 BAUDELAIRE M *59559
 BAUER C F *58249
 BAUERLE G L *58250
 BAUM F *58251
 BAUM J P *58252, *58253, *58254, 58255
 BAUM K *58255
 BAUMAN D *58256

BAUMANN J C 59329
 BAZES J G I *58257
 BEACH G H 58544
 BEACH J M 59146
 BEALL S E *59305
 BEAUDOIN G *58258
 BEAVON D K *58259, *58260
 BECKER K P *58261
 BECKER R *58262, *58263
 BECKMAN E B *58264
 BEEDGEN O *58111
 BEHRENS K *59657
 BEJERMAN D 59440
 BELINSKIY S Z 59597
 BELL C W *58265
 BELL Z G JR *58266
 BELLEGIA F L 58148, *58267
 BELOKON S M 59522
 BELOUSOV V V 59084
 BELTR J *59498
 BELYAEV P N 59673
 BENEDICT J W *58268
 BENNINGSON R M *58269
 BENNETT J *58112
 BENSON R S *58270
 BERG R E *58271
 BERGER B J *59306
 BERGER H *58272
 BERGER H W 58272
 BERGOUGNOU M A 58915
 BERKAU F E 59536
 BERLIN Z L *59658
 BERNADINER M N 59051
 BERNARD A A 58273
 BERNARD R A *58273
 BERNHARDT A A *59700
 BERNHARDT W *58274
 BERNSTEIN L S *59614
 BERREBI G 59102
 BERRY M A *58275
 BERTI V *58276
 BERTODO R *58277
 BERTSCH J F *58278
 BERZ M *58279
 BERZ W 58279, *58280
 BESALKE R E *59307
 BESKOV V S 59592
 BETHEA R M *59308
 BETTIS E S 59305
 BEYCHOK M R *58281
 BHATIA M V *59309
 BHATIA S P *59615
 BIBBO P P *58282
 BIDWELL R *58283
 BIENSTOCK D 59512
 BIER K C *59310
 BIGNON M *59616
 BILLINGS C E *59311
 BIRD A J 59294
 BISCHOFF W F *58284
 BITNER J L 59562
 BITTELMAYER H *58285
 BJERKLIE J W 58724
 BJORKLING H *58286
 BLAKE R J 58232
 BLAKEY P R *59499

BLAZOWSKI W S

BLAZOWSKI W S *58287, *58288
 BLECHER W A 58974
 BLEVINS J R 59229
 BLITZER S M *58289
 BLOCK C F 58662
 BLONSKA J 59523
 BOEGNER F 58140
 BOEHM E *58290
 BOEHM H G 59374
 BOEHME W 58174, 59067
 BOENING G *58291
 BOERSMA M A M *58292, *58293, *58294
 BOGARDUS H F *59312
 BOGATIE C F *58295
 BOHN H L *58296
 BOHN T *58113
 BOLL C H *59313
 BOLLE D *58297
 BOLT J A *59682
 BOLTON M S *59500
 BONING G 58632
 BONNIFAY P 59567
 BORGWARDT R H *58298
 BORIO D C 58494
 BORISOV N L 58900
 BORNSTEIN L J *58114
 BORSHEIM L A *58299
 BOSCAK V *58300
 BOSCH P J W M VAN DEN *59314
 BOSE R K *58301
 BOWEN D G 59540
 BOWER A M *58302
 BOWERMAN G W *58303
 BOYERT D L 59142
 BOZZUTO C R 58678
 BRADWAY R M *58304
 BRAEUTIGAM H *58305
 BRAGILEVSKAYA L I 59597
 BRAND H D *58306, 58975
 BRANDEL A 58319
 BRANDENBURG J T 58243
 BRANDI H T 59657
 BRANDSTETTER W R *58307
 BRANDT A D *59617
 BRANDT H *59315
 BRANLAND R C A *59316
 BRATZLER K *58115, *58308
 BRAUN B O *58309
 BRAY U B *58310
 BREELLE Y 58996
 BRETTSCHEIDER J 59215
 BROAD J 58910
 BROADBENT D *59317
 BROCOFF J C 58430
 BRODSKY Y *58311
 BROER W T *58116
 BROOKS J W *58312
 BROSE W *58313
 BROST O *59318
 BROWN G N *59319
 BROZENICK N J 58376
 BRUN LABARRE E *59501
 BRUNS P H *58314
 BRYAN R J *58315
 BRYAN W P *59560
 BRYERS R W *58316
 BUCHANAN J S 59700
 BUDDE H J *58317
 BUDYAK V F *58318
 BUIJSERD A M *58117
 BULTEZ A *58319
 BUMP R L *58118
 BUNDA T *58320
 BUNDY R P *58321, *58322
 BUNYA K *58323
 BURCHARD J K *58324
 BURDOCK J L *59668

BURGEHL JR 58703
 BURGER H *58325
 BURKLINE C E *58326, *58327
 BURNS J A 58690
 BURTON R S III *58328
 BUSSE W 59214
 BUTRYN G L *58329
 BUTT S H 58440, 58441
 BUTWELL K F 58232
 BYKOV A P 59139

C

CACERES S *58330
 CAHILL T A 58414
 CALABRO D S 58509
 CALDERON A *59320
 CALDWELL R B *58331, *58332
 CALVERT S *58333, *58334, *58335, 58414
 CALVIN E L *58119
 CAMPBELL C L 58399
 CAMPBELL D W 59164
 CAMPBELL K S 58414
 CAMPBELL N T 58509
 CAMPOLONG J *58336
 CANNON T *59321
 CANT N W *58337
 CAPPELLI P G *58338
 CAPRON J W *58120
 CARADUS W G *58339
 CARCEA G *58340
 CARETTO L S 58257
 CARLSON D W 58207
 CARLSON L D 58959
 CARLSSON K *58341
 CARLTON H E 58177, 59082
 CARMICHAEL R L 58582
 CARSON D B *58342
 CARTER I W 58476
 CARTER J L *58343
 CARTER W A 58703
 CASANOVA J *59669
 CASS G R *59502
 CASS R W 58304
 CASTELINE P JR *58344
 CASTLE G S P 59447
 CAVALLARO J A *59322
 CAVANAUGH E C 58326, 58327
 CERNY F *59670
 CESARIO F J *58345
 CESSLIN P *59323
 CHA S S 58664
 CHAMBERLAIN C T *58346
 CHAMBERN M G J DU *58347
 CHAMBRILLON P 58277
 CHANA H E *58348
 CHANDLER R E *58349
 CHAPMAN M T 58343
 CHAPMAN W H *58350
 CHAPPELL G A *59503
 CHAPUT H *59618
 CHARD N T J *59504
 CHARMES A *58351
 CHARPENTIER J C *58352
 CHAUHAN S P 58177, 59082
 CHENG S I 58582
 CHEREMISINOFF P N 58196, 59309,
 *59324, *59325, 59482
 CHERNIKOV V P 59591
 CHERNYSHEVA K B 59568
 CHIC T *58353
 CHIESA W *58354
 CHINNOCK C R *58355
 CHOI P S K *58356
 CHOMA M A 59598
 CHOUDHARY K R 58481

AIR POLLUTION ABSTRACTS, JUNE 1976

CHRISTMAN R D *58357
 CIACCIA F 58338
 CILIONE P F *58358
 CLARK R C 59312
 CLARKER R H *58359
 CLARKE W J 58359
 CLAWSON L G *58360
 CLEMENTS R F 59333
 CLINE L D *59326
 COATES F I 58423
 COBARG C C 59374
 COCHRAN J K 59419
 COLE R B 59400
 COLLIER R F *59706
 COLLMAN J S *58361
 COMBS L P *58121
 COMPTON W A *58362
 CONDRIY L Z *59619
 CONSER R E *59327
 CONSIDINE M 58802
 COOKE D F 58346
 COOPER B J *58363, *59505
 COOPER D E *58364
 COOPER R E *59328
 COPPA G *58365
 CORBLE J C 58958
 COSTER J P D E *59690
 COTTER R J *58366
 COTTON B L 58585
 COX V F 58448
 CRAIG G D 59391
 CRENTZ W L *59620
 CROAT J J 58652
 CRONKRIGHT W A JR *58367
 CROSBY R L 58939, 58940
 CROUCH W B *58368
 CROW J H *59329
 CRUZ I E *58369
 CTVRTNICEK T E *59330
 CUBICOTTI D 59208
 CULLEN P F *58370
 CUMMINGHAM S J 59246
 CVICKER J S 58284

D

D OLIER G *58371
 DAHLEM F E 58596
 DAILEY L W 59680
 DALTON C 58582
 DANIEL L R JR *59701
 DANIELI G A 58431
 DANIELS A 59078
 DARBY K *59561
 DARLING A S 58191
 DATE T *58372
 DAUGHERTY K E *59331
 DAVIDS P *58373, *58374
 DAVIDSON P J 59294
 DAVIS E R *58375
 DAVIS W T 58680, 58875
 DAY D L 59434
 DE JONG K H 58711
 DE JONG W A 59314
 DE WEERT G 58116
 DE WEESE D P *58376
 DEANE C T *58377
 DEBUCES S 58549
 DECKER G 58307
 DEGTEV O N 58201
 DEHAAS G G 59580
 DEITZ V R *59562
 DEKANY J P 59547
 DEMETER J J 59512
 DEMETRIE P *58378
 DEMING M E 58667

AUTHOR INDEX

DENISOV V V *58379
DENNIS R 58321
DENTON G H *59563
DEPRIMO M J 59539
DESCHAMPS A 58963, 58964, 59430, 59431, 59567
DESLANDES J V 59206
DESTY D H *58380
DEURBROUCK A W 59322, 59620
DEUSTER G *59332
DEVITT T W *58122
DEWEY E A *59333
DEZAEL C 58963, 58964, 59430, 59431
DICHEV I *59334
DICK H D *58381
DICKERMAN J C 58326, 58327
DIECK R L 58163
DIEGES P B *59335
DIEHL R E *58382
DIMENKO V N *58383
DISHART K T 59635
DISMUKES E B *58384
DIXIT D K *58385
DIXSON B E *58386
DJAVANMARD H 59695
DLASKA H *58387
DO L 58330
DOBROVOLSKIY I P 58483
DOCHINGER L S 59063
DOERGES A 58115, 58308
DOERR K H 58962
DOERSCHLOG C *59506
DOERSCHUK V C *59697
DOHERTY K S *58388
DOI H 58698
DOJKA M *58389
DORR K H 58961
DOTY W W 58239
DOUGLAS C J *59336
DOWDY M W *58390, 58563, 58576
DOXEY G *59675
DREHMAN L E *58391
DRESSSEL W M 58939, 58940
DREWS U 59214
DROESCH A 59013
DUBACH P *58392
DUCOFFE A L 58581
DUERRFELD R 58426
DUFOUR R J 59038
DUHAUT P *58393
DUHOMEZ R 59323
DULIN J M *58394
DUNN K S *58395
DUNNERY D A 58232
DUPPS J A SR *58396
DURIE R A *58397
DUTRIAU R 59567
DYENS P J *58398
DYRSCHKA H 59468

E

EADS R *58399
EARL C B *59337
ECCLESTON B H 59375
ECCLESTON D B 59375
ECHIGODANIE *59338
ECKSTINE J T 59098
EDYE E *58400
EFENDIEV T B *58401
EGGER K W *58402
EGUCHI Y *58403
EHLEN J W *59339
EHRICH F F *59340
EHRICH W *58404
EHRlich S 58936

EICHELMANN J F JR 58350
EICKELPASCH D *59564
EICKHOFF H G 58113
EIMUTIS E C 58353
EKNAYAN H *58405
EKSTEDT E E *58406
ELSBETT L *58407
ELTZE G *58408
EMUKAIN *59507
ENDO K *58409
ENDO R *58410
ENDO Y 58849
ENGDAHL R B *58411, *58412
ENGLE J P 59551
ENGLISH M *59676
ENKE C G *58413
ENNEKING H 59261
ENNEKING J C *59508
ENOMOTO Y 58465
ENSOR D S *58414
EPSTEIN M *58415, *58416, *59341
EREMIN A T 58479
ERHARD W *58417
ERIKSSON B 58637
ERMAKOV Y P 59592
ERNEST M V 59032
ESKOV V I 59112
ESAKIN *59565
ESCHE M *58418
ESILEVICH B S 59051
ESTELLE C JR *58419
ESTES E M *59566
EVANS G R *58420
EWAN T K *58123

F

FAHRENBRUCK F S 58287
FAIX L J 58801
FAN L S 59212
FARHA F E 58391
FARMER A D *58421
FARMER R C *58422
FARRIER P M *58423
FATTINGER V *58424
FAURE F *58425
FEDOR R J *59342
FEDYUNIN I A 58492
FEISTEL P P *58426
FELDMANN H F 58177, 59082
FELDNER G F *58427
FENG C L *58428
FENNESSY F J *58429
FENTON D M *58430
FERGUSON C R *58431
FERNANDES S R 58326, 58327
FERRARI L 59583
FERRETTI E J *58432
FERRI A *58433
FESTIN T F 58369
FICEK K J *59343
FICHEL K *58434, *58435
FIELDING G H 59312
FIFE J A *59344
FILSS P *58436
FINEGOLD J *59345
FINLAYSON A 59484
FIRST M W *58124, 58145
FISCHER F A *58437
FISCHER H *59346
FLEMING D K *58438
FLETCHER L N 59423
FLING R B 58114
FLOCHINI R G 58414
FLYNN P C *58439
FOOTE L R 58258

GAZAN G A

FORCK B 58765
FORD J 58200
FORD J A *58440, *58441
FORD R *58442
FORD W R *58443
FORDER G 59585
FORMANEK J *59347
FORSTEN H H *58444
FOSTER C L *58445
FOSTER J F 59082
FOWLER C P *58446
FOX H G *58447
FOX L K 58728
FOX R G *58448
FRANCKOWIAK S 58248, 58963, 59304
FRANKE F H *58449, *58450
FRANKLIN N F *58451
FRANKOWIAK S *59567
FRANTZ V L *58452
FRENCH G B 58328
FREVEL L K *59621
FREY J W 58820
FREYN F 59497
FRIBERG N *58453
FRIBERG S E *58454
FRICKE H J *58455
FRIEDRICH F D 59671
FRKAL J 58987
FROST R A 58243
FU Y C *58456
FUEHRING H *58457
FUEST R W 59581
FUJIMA Y *59116
FUJIMOTO K *58458
FUJIMOTO T 58780
FUJIO S *58459
FUJISAWA H *58460
FUJITA S 59595
FUJIWARA T 58840
FUKUBAYASHI H H 59370
FUKUHARA T 58570
FUKUI J *59348
FUKUI Y *58461
FUKUZAKI K *58125
FUKUZAWA H *58462, 58608
FUNABASHI I 58154
FUNAMOTO K *58463
FURGASON R R 59449
FURLONG D B *58464
FURUHAMA S *58465, *58466

G

GABOURY W J 59089
GAERTNER E *58467
GAGE J R *58126, *58468
GAGNAUX G *58469
GALESKI J B 58138
GALLAGHER P K 58629, *59349, 59379
GALLES H C *58470
GALLOT M J *58471
GALOW M 58512
GAMBELL J W 58980
GANZ S N *59673
GAPPA G 58636
GARCEA G *58472, *59350
GARDNER C O *58473
GARG S C 59219
GARRETT K *58474
GARTSIDE R J 59223
GARY J H 58797
GAST R A *58475
GAUL P *58476
GAVRILOVA A A *59351
GAYSERT G *58477
GAZAN G A *58478

GEHRHARDT J W

GEHRHARDT J W 58254
 GEL PERIN N I *58479
 GEMINDER G 59435
 GENTON R G *58480
 GENTRY J W *58481
 GEORGE Z M *58482
 GERASIMOV D A *58483
 GERASKINA L G *59568
 GERKEN A *58484
 GERLACH J *59693
 GERMERDONK R *58485
 GERSTLE R W *58486
 GHOSH S K 59057
 GIACOLETTI J B 59462
 GIAMMARCO G *58487
 GIAMMARCO P 58487
 GIAVARINI C *58488
 GIBSON I J *58489
 GIGGINS F B JR 59024
 GILBERT T *58490
 GIRAMONTI A J 58974
 GIRODIN M *58491
 GLASER H 59468
 GLAZER F *59352
 GLEASON R J *59622
 GLEBOV V P *58492
 GLOMM H 58958
 GLUCKSMAN D Z *58493
 GLUECK A R *59353
 GNYF A W *59509
 GOERGEN R 59604, *59623
 GOGINENI M R *58494, *59510
 GOLDEN J O 58797
 GOLDSCHMIDT K *58495
 GOLITSYN A N 59658
 GOMMI J V 59580
 GONZALEZ N 58330
 GOOCH J P *58496
 GOODING C H 58148
 GORANSSON R *58497
 GORDON C G *58498
 GORMAN P G *58499
 GOTO K *58500, *58501
 GOTTESMAN B S 59528
 GRABKO L S 59546
 GRABOVICH V A *58502
 GRAFFEO A J 59086
 GRAHAM R C 58498
 GRAINGER L M D *59354
 GRANCHER P 58516
 GRANDET L 58740
 GRANT E P *59683
 GRAY L O 59257
 GREEN R J *58503
 GREFF T S 59049
 GRIESCHE G *58504
 GRIFFIN D C 58390
 GRIFFIN L I JR 59211
 GRIGOROV V P 59093
 GRIMM H 58961, 58962
 GRISELL C P *58505
 GRISHKO V Z 58479
 GROSCHE M *58506, *58507
 GROSCLOSE I L 59539
 GROSSEAU A *58508
 GROTH R H *58509
 GRUDEN D *58510
 GRUENWALD G *58511
 GRUENWALD D 58300
 GRULICH H *58512
 GUBAREV V G 59051
 GULATI I B 59057
 GULATIST *58513
 GULLETT J T *58514
 GUNTHER E 59540
 GUSTAVSSON K A G *58515
 GUTH H *59659

GUYOT G *58516
 GWYN J E 58651

H

HAAS L A *58517
 HAASE L H *58518
 HACKLER E 58512
 HAEFFLE W *58519
 HAGEN H *58520
 HAGER J 58251
 HAGEY G *59355
 HAGY H E 58513
 HAIGH D H *59660
 HAILER K E 59664
 HALL R H 59660
 HALL R R *58521
 HALL T D 58857
 HALTER G M 58582
 HAMBLIN R J J 58977
 HAMEL F B 59663
 HAMERSMA J W 58797, *59511
 HAMIL H F 58193
 HAMILIUS A 59540
 HAMM J R 58659
 HAMMER K *58522
 HAMMERSCHMID E 59010
 HAMMERSCHMID G *58523
 HAMRIN C E JR *58524
 HANAMIZU I 59235
 HANAOKA M 58686
 HANDWERK J G 58797
 HANSEN W *58525
 HANSFORD R C *59356
 HARA H *58526
 HARADA S 58409
 HARADA T 58570
 HARADA Y *58527
 HARNED J L 59229
 HARPEL W L 59086
 HARPER H E 58875
 HARRIS H C 59201
 HARRISON D *59357
 HART J A 58748
 HART W L *58528
 HARTEL W 58800
 HARTMANN G 59018
 HASEGAWA H 59694
 HASEGAWA T *58529
 HASEGAWA Y 59461
 HASHIMOTO E *59569
 HASHIMOTO K 59556
 HASSEL R E 59563
 HATA T *58530
 HATFIELD J D 58667
 HATHAWAY S A 58969
 HAUCK J E *59570
 HAUEISE R R *59624
 HAUSBERG G 58495, *58531, *59358
 HAUSER K V *58532
 HAVER F P *58127
 HAWKINS G L *58533
 HAYASHI H 58536, *59571, *59625
 HAYASHI K 58536
 HAYASHI M *58534
 HAYASHI T *58535, 59579
 HAYASHI Y *58536, 58847
 HAYASHIDA M *58537
 HEALY G W *59626
 HEAP M P 58751, 58800
 HEATHCOTE L A 58191
 HEBBEL G *58128
 HEBERT J J 58582
 HECHT V *58538, *58539
 HECK R H *59359
 HEDLEY W H 58353

HEGARTY R *58129
 HEGARTY W P *58540
 HEGEMANN K R 59358
 HEIDACKER W C *58541
 HEIDELBERGER W *59360
 HEININGER R C 58120
 HEINRICHS F *58542
 HEINZE R C 59399
 HEISER R W 59131
 HEITZ W D 58366
 HELFRITZ D J *58543, *58544
 HELKE R *58545
 HELMENSTEIN S *58546
 HEMSATH K H *58547
 HENDERSON J M *59361, *59362
 HENDERSON J N *59363
 HENDRICKSON E R *59364
 HENKE A M 58357
 HENKEL H J *58548, *58549
 HENNENBERGER K H 58962
 HENRY J M *59512
 HENSLEY E F 58858
 HERR E *59365
 HERR G A *59366
 HERRBRICH B *59367
 HERSHAFT A 59352
 HERVERT G L 59077
 HESKETH H W *59368
 HESS F D 58114
 HESS K 58262, 58263
 HEWS C F *59369
 HEYWOOD J B 58431, *58550
 HICKEY H R 58904
 HIDA M 58323
 HIGH C F *58551
 HIGLEY L W *59370
 HILDEBRAND F C 58969
 HILL D G *59572
 HILL G R 59537
 HILL L O 58972
 HILLER H *58552
 HILSHEIMER H *58553
 HINDERLITER C R *58554
 HINDS W C 58124
 HIPPELI R F 59517
 HIRAI M *58555
 HIRAKO Y *59371
 HIRAOKA H 59044, 59125
 HIRASAKA T *58130
 HIRATO M *58556
 HIRAYAMA N *58557
 HIRAYAMA Y 58612
 HIRDLER L C *58558
 HIROSE Y *58559
 HIRSCH M R *59661
 HIRUMA M 58465
 HISANO M *58560
 HISHIDA K *58561
 HISSONG D W *58131, 58356
 HOBSON M J *58132
 HOCHGESAND G 58511
 HODGES J L *58562
 HODGKINSON G E 59675
 HODGSON J N *59513
 HOFFEKKEN E 59657
 HOEHN F W 58390, *58563
 HOELSCHER H 59025
 HOFBAEUER P *58564
 HOFBAUER P 58979
 HOFFMAN J A 59000
 HOFFMAN M I III 58386
 HOFFMANN G W *59514, *59515
 HOLLAND R F *58565
 HOLLENBERG J W 59400
 HOLLIS T J JR *58566
 HOLM F W 58582
 HOLOWATY M O *59627

GEHRHARDT J W 58254
 GEL PERIN N I *58479
 GEMINDER G 59435
 GENTON R G *58480
 GENTRY J W *58481
 GEORGE Z M *58482
 GERASIMOV D A *58483
 GERASKINA L G *59568
 GERKEN A *58484
 GERLACH J *59693
 GERMERDONK R *58485
 GERSTLE R W *58486
 GHOSH S K 59057
 GIACOLETTI J B 59462
 GIAMMARCO G *58487
 GIAMMARCO P 58487
 GIAVARINI C *58488
 GIBSON I J *58489
 GIGGINS F B JR 59024
 GILBERT T *58490
 GIRAMONTI A J 58974
 GIRODIN M *58491
 GLASER H 59468
 GLAZER F *59352
 GLEASON R J *59622
 GLEBOV V P *58492
 GLOMM H 58958
 GLUCKSMAN D Z *58493
 GLUECK A R *59353
 GNYPA W *59509
 GOERGEN R 59604, *59623
 GOGINENI M R *58494, *59510
 GOLDEN J O 58797
 GOLDSCHMIDT K *58495
 GOLITSYN A N 59658
 GOMMI J V 59580
 GONZALEZ N 58330
 GOOCH J P *58496
 GOODING C H 58148
 GORANSSON R *58497
 GORDON C G *58498
 GORMAN P G *58499
 GOTO K *58500, *58501
 GOTTESMAN B S 59528
 GRABKO L S 59546
 GRABOVICH V A *58502
 GRAFFEO A J 59086
 GRAHAM R C 58498
 GRAINGER L M D *59354
 GRANCHER P 58516
 GRANDET L 58740
 GRANT E P *59683
 GRAY L O 59257
 GREEN R J *58503
 GREFFTS 59049
 GRIESCHE G *58504
 GRIFFIN D C 58390
 GRIFFIN L I JR 59211
 GRIGOROV V P 59093
 GRIMM H 58961, 58962
 GRISSELL C P *58505
 GRISHKO V Z 58479
 GROSCHE M *58506, *58507
 GROSECLOSE I L 59539
 GROSSEAU A *58508
 GROTH R H *58509
 GRUDEN D *58510
 GRUENEWALD G *58511
 GRUENWALD D 58300
 GRULICH H *58512
 GUBAREV V G 59051
 GULATI B 59057
 GULATI S T *58513
 GULLETT J T *58514
 GUNTHER E 59540
 GUSTAVSSON K A G *58515
 GUTH H *59659

GUYOT G *58516
 GWYN J K 58651

H

HAAS L A *58517
 HAASE L H *58518
 HACKLER E 58512
 HAEFELE W *58519
 HAGEN H *58520
 HAGER J 58251
 HAGEY G *59355
 HAGY H E 58513
 HAIGH D H *59660
 HAILER K E 59664
 HALL R H 59660
 HALL R R *58521
 HALL T D 58857
 HALTER G M 58582
 HAMBLIN R J J 58977
 HAMEL F B 59663
 HAMERSMA J W 58797, *59511
 HAMIL H F 58193
 HAMILIUS A 59540
 HAMM J R 58659
 HAMMER K *58522
 HAMMERSCHMID E 59010
 HAMMERSCHMIED G *58523
 HAMRIN C E JR *58524
 HANAMIZU I 59235
 HANAOKA M 58686
 HANDWERK J G 58797
 HANSEN W *58525
 HANSFORD R C *59356
 HARA H *58526
 HARADA S 58409
 HARADA T 58570
 HARADA Y *58527
 HARNED J L 59229
 HARPEL W L 59086
 HARPER H E 58875
 HARRIS H C 59201
 HARRISON D *59357
 HART J A 58748
 HART W L *58528
 HARTEL W 58800
 HARTMANN G 59018
 HASEGAWA H 59694
 HASEGAWA T *58529
 HASEGAWA Y 59461
 HASHIMOTO E *59569
 HASHIMOTO K 59556
 HASSEL R E 59563
 HATA T *58530
 HATFIELD J D 58667
 HATHAWAY S A 58969
 HAUCK J E *59570
 HAUEISE R R *59624
 HAUSBERG G 58495, *58531, *59358
 HAUSER K V *58532
 HAVER F P *58127
 HAWKINS G L *58533
 HAYASHI H 58536, *59571, *59625
 HAYASHI K 58536
 HAYASHI M *58534
 HAYASHI T *58535, 59579
 HAYASHI Y *58536, 58847
 HAYASHIDA M *58537
 HEALY G W *59626
 HEAP M P 58751, 58800
 HEATHCOTE L A 58191
 HEBBEL G *58128
 HEBERT J J 58582
 HECHT V *58538, *58539
 HECK R H *59359
 HEDLEY W H 58353

HEGARTY R *58129
 HEGARTY W P *58540
 HEGEMANN K R 59358
 HEIDACKER W C *58541
 HEIDELBERGER W *59360
 HEININGER R C 58120
 HEINRICH F *58542
 HEINZE R C 59399
 HEISER R W 59131
 HEITZ W D 58366
 HELFRITZ D J *58543, *58544
 HELKE R *58545
 HELMENSTEIN S *58546
 HEMSATH K H *58547
 HENDERSON J M *59361, *59362
 HENDERSON J N *59363
 HENDRICKSON E R *59364
 HENKE A M 58357
 HENKEL H J *58548, *58549
 HENNENBERGER K H 58962
 HENRY J M *59512
 HENSLEY E F 58858
 HERR E *59365
 HERR G A *59366
 HERRBRICH B *59367
 HERSHAFT A 59352
 HERVERT G L 59077
 HESKETH H W *59368
 HESS F D 58114
 HESS K 58262, 58263
 HEWS C F *59369
 HEYWOOD J B 58431, *58550
 HICKEY H R 58904
 HIDA M 58323
 HIGH C F *58551
 HIGLEY L W *59370
 HILDEBRAND F C 58969
 HILL D G *59572
 HILL G R 59537
 HILL L O 58972
 HILLER H *58552
 HILSHEIMER H *58553
 HINDERLITER C R *58554
 HINDS W C 58124
 HIPPELI R F 59517
 HIRAI M *58555
 HIRAKO Y *59371
 HIRAOKA H 59044, 59125
 HIRASAKA T *58130
 HIRATO M *58556
 HIRAYAMA N *58557
 HIRAYAMA Y 58612
 HIRDLER L C *58558
 HIROSE Y *58559
 HIRSCH M R *59661
 HIRUMA M 58465
 HISANO M *58560
 HISHIDA K *58561
 HISSONG D W *58131, 58356
 HOBSON M J *58132
 HOCHGESAND G 58511
 HODGES J L *58562
 HODGKINSON G E 59675
 HODGSON J N *59513
 HOFFEKEN E 59657
 HOEHN F W 58390, *58563
 HOELSCHER H 59025
 HOFBAUER P *58564
 HOFBAUER P 58979
 HOFFMAN J A 59000
 HOFFMAN M I III 58386
 HOFFMANN G W *59514, *59515
 HOLLAND R F *58565
 HOLLENBERG J W 59400
 HOLLIS T J JR *58566
 HOLM F W 58582
 HOLOWATY M O *59627

AUTHOR INDEX

HOLT N A 58109
 HOLZAPFEL G L *59372
 HONDA J 58218
 HONIDEN Y *58567
 HONIG G *58568
 HONNEN L R *58569
 HOPTON F J 59596, 59630
 HORD J 58222
 HORIE K 58526
 HORIE M *58570
 HORII N 58458
 HORIKAGO H *58571
 HORIKAWA M 59236
 HORIO Y 58908
 HORNTVEDT E 58209
 HORVATH Z *58572
 HORWINSIK E R *58573
 HOSHINO T 59044, 59045, 59125
 HOSHIRO T *58574
 HOSHO Y 59240
 HOSOI T 58461, *58575
 HOSOYA Y 59044, 59045
 HOUGH J F 58258
 HOUSEMAN J *58576
 HOUSTON R *58577
 HOWARD F S *58578
 HOWELL B M *58579
 HOXIE E C *58133
 HRNCIR J 59466, 59467
 HSU Y T *58580
 HUANG A B *58581
 HUANG C J *58582
 HUBER C V *59373
 HUBERT B V 59316
 HUCH R *58583
 HUEBLER W *58584
 HUFF J E 58174, 59067
 HUGHES T W 59330
 HUISKING T 58335
 HUKUZAWA H 58609
 HULTMAN B G 59316
 HUMISTON G F *58585
 HUMPHRIES J J JR *59662
 HUNDHAUSEN E *59374
 HUNT D H *58586
 HUNTER J *58587
 HUNTER J E JR *58588
 HURN R W *59375
 HUYSMAN H 59323
 HYDE P E *59376
 HYMAN M H *58589

I

IANNIBELLO A 58276
 ICHIHARA S 58526
 IGARASHI M *58134
 IGUCHI M 59132
 IJIMA H 58757
 INUMA K *58590
 IZUKA Y 59124
 IKEDA M 59138
 IKEDA S *58591
 IKEDA Y 58152
 ILLIG E G 58456
 IMAI T 58905
 IMAI Y *58592
 IMAIZUMI K *58593
 IMAMURA Y 59148
 IMAURA M 59104
 IMMETHUN P A 59409
 INABA K 59132
 INABA S *58594
 INADA T 59198, 59199
 INAGAKI N 59507, 59565
 INAGAKI S *58595

INAZUMI C 58647
 INODA T 58813
 INOUE K 58868, 59117, 59127, 59128
 INVERARDI R *59377
 IRELAND R D JR *58596
 IRIE T *58597
 IRIKURA H 58841
 ISAACS G A 58106, 58107, 58486, *58598,
 *58599, *58600, *58601, *58602, *58603,
 *58604, *58605, *58606
 ISHAHAYA F *58607
 ISHIBASHI Y 59579
 ISHIGURO K 59127, 59128
 ISHIHARA Y 58462, *58608, *58609
 ISHIKAWA N 58501
 ISHIKAWA Y 58615, 58616
 ISHINO K *58610
 ISHIO K 58668
 ISHIZAKI S *58611
 ISODA T 58597
 ITO K *58612
 ITO M *58613, *58614
 ITO N 58756
 ITO S 58872, 59148
 ITO T 58613, 58614
 IWAIN 59574
 IWAO N *59573
 IWASA K 58672
 IWASAKI Y 59408
 IWATA H *58615, *58616

J

JACKO R B 58425
 JACKSON B S 58414
 JACKSON W J *59516
 JAHNIG C E *58617, *58618, *58619, *58620
 JAKOB F *58621
 JAMES R *58622, *58623
 JANOWSKI K R 59077
 JANSSON S A 58659
 JARCO P *59674
 JAWORSKI H K 59540
 JENNETT J C 59222
 JENNIGES E *58624
 JENSEN K *58625
 JENSEN R A *58626
 JENSEN G A *59378
 JERDE J B *58627
 JHAVERI N C 58335
 JURUS E J 58430
 JO S *58628
 JO Y *59574
 JOBST J *58135
 JOHNSON A X *59517
 JOHNSON D W JR *58629, 59349, *59379
 JOHNSON M M *58630
 JOHNSON R 59540
 JOHNSON S A 58746
 JOHNSON T F *58631
 JOHNSTON J W *59380
 JONAKIN J 59510
 JONAS L A 59297
 JONES A H *59575
 JONES B A JR 59434
 JONES B R 59540
 JONES G E 59373
 JONES H C 58904
 JONES M V 58353
 JONES R 58353
 JONES R E *59518
 JONES W J 58150, 58151
 JONES W P *59705
 JONKE A A 59069
 JORDAN J E 59588
 JORDAN W V *58632

KELLY H D

JORISSEN H D *58633
 JOSHI S *58634
 JOUSTRA P 59540
 JOZLIN J A *58635
 JUENTGEN H 58426
 JUNTGEN H *58636
 JUSTICE N 58666
 JYSKY G *58637

K

KACHURINETS L P *58638
 KADOI K 58410
 KAERCHER L T *59381
 KAGAYA H 59132
 KAGAYA M *58639
 KAHANE R 59417
 KAHNWARD H 59564
 KAJIMA T *58640
 KAJIMA T 59106
 KAKEGAWA Y 59236
 KALEN B *59382
 KALEV I 59334
 KALFADELIS C D *58641
 KALINKINA L I *58642
 KALLAN L E 59704
 KALMARU A M 59112
 KAMATA H 59542
 KAMIGAITO O 58698
 KAMINSKI J B 58355
 KANDORI T 58698
 KANEKO Y 58320
 KANZAKI K 59120
 KARASAWA W 59410
 KARASEV A P 59165
 KARPUKHOVICH D T 59073
 KARWAT H 58710
 KASAI J *58643
 KASAMATSU T *58644
 KASAOKA S *58645
 KASCHKE W 59023
 KATAGIRIA *58646, *58647, 59254
 KATAOKA K 59371
 KATO C 59600
 KATO S *58648, 59574, 59647
 KATO T 58685, 58880
 KATSNEL SON B D *58649
 KATSOBASHVILI Y R *58650
 KATSUMATA S *59576
 KATTAN A *58651
 KATZ S *58652
 KATZER J R 59359
 KATZMAN H *59383
 KAWABATA S 58681, 58682, 58683
 KAWAGUCHI K *58653, *58654
 KAWAGUCHI T 59573
 KAWAMOTO K *58655
 KAWANA Y 58685
 KAWANAKA A *58136
 KAWARADA J 58409
 KAWASAKI H *58656
 KAWASAKI K 58643
 KAWASAKI S *58657
 KAWASE B *58643
 KAWATA M 59111
 KAWATA T *58658
 KAYLE E L 58234
 KAZAHOVA E A 59532
 KEAIRNS D L 58160, *58659, 58883
 KEARBY K K 59614
 KEARSLEY W H *58660
 KECK J C 58431
 KEISTER H G 58575
 KELLEY C N *58661
 KELLEY G W 58875
 KELLY H D *58662

KEMMETMUELLER R *58663
 KENDALL J P 59061
 KENSON R E *58664
 KENVON R A *58665
 KEOGH M J 58366
 KERANEN T W *59628
 KESSLER M M 58150, 58151
 KETT T K *59384
 KETTENBRINK E C JR 58582
 KEYES R E *58666
 KHALAFALLA S E 58517
 KHAN H A 58330
 KHANYUKINA O P 59156
 KHARICHEV N I 59084
 KHARMATS V E 59193
 KHAYMENOV A P 58985
 KHITERER R 59532
 KHVAN E A *59519
 KIENCKE U 58568
 KIENZLE E D 59497
 KIKUSHI T 58231
 KIM G 58776
 KIM Y K *58667
 KIMBER G E 59540
 KIMURA T *58668
 KIN A *58669
 KIPPE B 59447
 KIRCHHOFER H *58137, *58670
 KIRCHWEGE R K 58747
 KISCADEN R W 59243
 KISHIGAMI K *58671
 KISHIMOTO K *58672
 KISHKAREV V A 58879
 KISUNA K *58673
 KITAGAWA T 59138
 KITANI S *59577
 KITANO T 58892
 KITAYAMA T *58674
 KITTLE W F 58160, 58883
 KIYASHKO A V 59156
 KIYONO M 58646
 KIZIM I A 58965
 KIZLER H *58675, 59017, 59018
 KLEIMAN G *58676
 KLEIMAN H L *58677
 KLEIN H A *58678
 KLEINE KLEFFMANN W 59657
 KLETT M G *58138
 KLIMECEK R *59629
 KLIPSTEIN D H 58227, 58986
 KLOECKER K J 58162
 KLUGE W *58139
 KNOBLAUCH K 58636
 KNOEDEL P A *58679
 KNOLL K E *58680
 KNOP W *59385
 KOBASHI K 58873, 58874
 KOBAYASHI H 58671, *58681, *58682,
 *58683, 58704
 KOBAYASHI I *58684
 KOBAYASHI K *58685
 KOBAYASHI M 59171
 KOBAYASHI N *58686
 KOBAYASHI S *58687, 58992
 KOBAYASHI T *59578
 KOBYLINSKI T P *58688, *58689, *59386
 KOBYLSKI J 59520
 KOCH C 58549
 KOCH G 58693
 KOCH H 58632
 KOCK C 58548
 KODRAS F D 58119
 KOEHLER G *58690
 KOEHLER G R *58691
 KOELN J A *58140
 KOENIG A 58274, *58692
 KOEPERNIK K H 58305, *58693, 59210

KOESTER H *58694
 KOHAMA T 59127
 KOHANA T 59128
 KOLESNIKOVA S G 58924
 KOLESNIKOVA T A *58695
 KOLEV N *58696
 KOLLER G 58522
 KOLOSE 58987
 KOLUBAJEW B *58697
 KOMATSU N *58698
 KOMIYAMA Y 58870
 KOMURA S 59542, 59579
 KOMURO T 58556
 KOMYOJIN 58323
 KONDO M *58699
 KONDO S 59167
 KONIECZYNSKI J *59520
 KONISHI J *58700
 KONISHI T *58701
 KONO N 59104
 KOONS H F 58958
 KOPITA R *58997
 KOPPANG R R *58702, *58703
 KORCHUNOV J N 58900
 KORMYSHEV V V 59522
 KOSCIANOWSKA L 58141
 KOSCIANOWSKI J R *58141
 KOSHIGAMI K *58704
 KOSHIZUKA K *58705
 KOSTKA H 58548
 KOTERA K 59411
 KOUMI H *58142
 KOUTSOUKAS E P 59511
 KOYAMA S *59579
 KOZIK C 59549
 KRAFT J 59521
 KRAFT M L 59511
 KRASHENNIKOV S A 59049
 KRASNOSELOV G K 59112
 KRAUTWURST H V *58706
 KRAVITZ S N *58707
 KREEGER A H 59513
 KRESSLEY L K 59621
 KRIPPENE B C 58926
 KRISCHKE H 58314
 KRIZEK J *59521
 KROCKTA H 59687
 KROCAK S 59520
 KROETZSCH P *58708, *58709
 KROPPEL 58356
 KROPPEL I 59162
 KRUGER G 58531
 KRUIS A *58710
 KRUPINSKI K C 58631
 KRUPPE H *58711
 KRYGOWSKI R P *59387
 KRYLENKO V I *59522
 KRZYSZTOFIK B *59523
 KUBOTA T *58712
 KUESTER J L 58582
 KUFMAN A S *58713
 KUIPERS H *59388
 KUKUSHKIN I V 59073
 KULYASOVA S V 59182
 KUMAGAI N 58815
 KUMAR A *59389
 KUMMER J T *58714
 KUNAKHOVICH A I 59658
 KUNCEWICZ L *58715
 KUNIN R *58716
 KUNUGIT 58458
 KUPCHINSKII I 59673
 KURAHASHI Y *58717
 KURAKINA E S 59182
 KURIAN P C *59524
 KURODA O *58718
 KUOKAWA M 58537

KUROSAWA K *58719
 KURYLKO L 59400
 KUSAKAWA H 59252
 KUSHCH A S 59397
 KUSHIYAMA S *58720
 KUTO T 59115
 KUTRYK E A *59390
 KUWUBARA H 58230
 KUZNETSOV I E 59673
 KVASHNIN N P *58721
 KYDD P H *58722

L

L NANE D L *58723
 LA HAYE P G *58724, *58725, *59391
 LAESSIG R R *58726
 LAFLEUR J C 58266
 LAHN G C 59384
 LAKE C 58414
 LAKMARKER G *59525
 LAMB A N *58727
 LAMB L W 59551
 LAMBT J J 58269, *58728
 LAMMA H *58729
 LANCASTER B W 58659
 LAND J S 59633
 LANG C J *59580
 LANGE G 58765
 LANGE K 58510
 LANGE K H *58143
 LANGE K R 58580, *58730
 LAROSA P J 58680
 LARSSON B S V *58731
 LASKY J S *59581
 LATEY N G *59526
 LATTY C W 59540
 LAUER K R *58732
 LAUGHLIN R G W *59630
 LAUGHLIN W C JR 59443
 LAUKONIS J V 58652
 LAUREN O B *59392
 LAVANCHY E *58144
 LAWSON A *59393
 LE DINH P H *58733
 LE GOVIC V *58734
 LEE G K *59671
 LEE J A 59024
 LEE R K *58735
 LEE S JR *58736
 LEE W 58274
 LEFEBVRE A H *58737
 LEIKERT K 58691
 LEININGER D *58738
 LEITH D S *58145
 LELIAERT R M 58732
 LEMMON A W JR *59394
 LENNINGTON J W 58787
 LENZ H P *58739
 LEONTIEVSKAYA A F 58900
 LEPAKHIN I A 59051
 LEPEVRE J M *58740
 LERNER B J *58741
 LESOKHINA G F 58695
 LEUNG J 58334
 LEUPPI F *58146
 LEVI V V 58900
 LEVINS P C 58728
 LEVOSHCHENKO A A 58777
 LEWIS J L 59633
 LIBBY W F 59383
 LIEBERMAN J A 58199
 LIENTZ L C *58742
 LIESEGANG L *58743
 LIFERENKO V A 58479
 LIIMATTA D R 58518

AUTHOR INDEX

LIN P W *58744
 LINDER E 59017
 LINDSAY R *59395, *59527
 LIPSCOMB V J *58745
 LIPSCOMB W O 58788
 LISAKUSAS R A *58746
 LISOVSKIY P V 59519
 LIST H *58747
 LLEWELYN R P *58748
 LOCKLIN D W *58749
 LOEFFLER F *58147
 LOKTEV B G 58777
 LONG R H *58750
 LOVETT W D *59396
 LOWE R E *59631
 LOWES T M *58751
 LOWNIE H W JR 58245
 LUCHTER S *58752
 LUKIN V D 58226
 LUKOSHKIN V L 59051
 LUKOSHKINA T D 59051
 LUNDGREN L E G 58454
 LUNDY J H 59144
 LUPANOV P A 59051
 LURIE B I 59051
 LUTES L D 58582
 LYNCH R P 58266
 LYON H H 58801
 LYON R L 58753
 LYON R S *58753

M

MAA P S 58524
 MACDONALD J E *58754
 MACK W A *58755
 MADDOX L A 58951
 MADKARNI R M 58269
 MAEDA I *58756
 MAEDA M 59573
 MAEDA S *59694
 MAEDA Y *58757
 MAEKAWA T *58758
 MAELZIG G *58759
 MAGEE E M 58641, *58760
 MAGEE R S 59400
 MAGEE W S JR 59297
 MAGHON H 58143
 MAI G *58761
 MAIER S *58762
 MAIR J *58763
 MAISCH W 59017
 MAJERCAK S 59674
 MAJERCAKOVA A 59674
 MAKSYMUK S 59229
 MAKUSHKIN A T 58649
 MALKI K 58494
 MALLAN G M *59582
 MALPASS A SR *58764
 MALY V 59674
 MANDEL H *58765
 MANDELIK B G 58367
 MANGRAVITE F J 59086
 MANIG G 58139
 MANN D B 58222
 MAPLES D 58582
 MARBLE R I *58766
 MARCHENKO G S *59397
 MARDLA I 58637
 MARENGO S 58276
 MARESKE A *58767
 MARGHITA D I *59528
 MARGRAFA *58768
 MARINO J 58967
 MARKOV A D 59546
 MARKUS G A *58769

MARNET H *59698
 MARSHALL D M *58770, 58926
 MARZALEK J 59549
 MARTENS S W *58771
 MARTIN F T *58772
 MARTINAT J J 58677
 MARTORANA D 58338
 MASAKI K *58773, *58774
 MASEK V *58775
 MASELEK J E 58586
 MASELLI J M *58776, 59032
 MASLOVSKII G V 59658
 MASON H B 59046
 MASON S 58283
 MATHEWS J C *58148, 58267
 MATHIEU P 58516
 MATHUR G K 58330
 MATSNEV V V *58777
 MATSUBARA T *58778
 MATSUDO I *58149
 MATSUI K 59542
 MATSUMOTO H 58758, *58779
 MATSUMOTO K 58717
 MATSUMOTO Z *58780
 MATSUO S *58781
 MATSUO T *58782
 MATSUOKA H 59252, 59253
 MATSUSHITA M *59398
 MATTHEWS C C 58361
 MAUBON A 59323
 MAUGH R E *58783
 MAUSS F *59695
 MAYLAND B J *59399
 MAYS L 58359
 MAZZELLA G 58974
 MCADAMS P F *58784
 MCALEVY R F III *59400
 MCBEE W C 59457
 MCCAIN J D 58865
 MCCANN C R 59512
 MCCARTNEY J S 58513
 MCCLURE R N *59529
 MCCONNELL L D 58321, 58322
 MCCONNELL R J *59530
 MCCORMICK T H 58517
 MCCOY J D *59663
 MCCREA D H *58785
 MCDONALD J R 58496
 MCDONALD P I *58786
 MCDONALD T L 58662
 MCDONNELL T F 59530
 MCDUGAL J A *58787
 MCGILL E C 58956
 MCKENNA J D *58788, 59622
 MCLAIN H W 59305
 MCLEOD J *59583
 MCILLWEE R J *59401
 MCRAE W A 59662
 MCROBERT A G 59186
 MEALEY M *59584
 MEDICI M *59531
 MEEKS T *58789
 MEEROVSKAYA V I *59532
 MEHQEMEJA S *59533
 MEISSNER P *58790
 MEITIN L M 59418
 MELBY R C *58791
 MELCHIOR J F *58792
 MELIN D D JR *58793
 MENGON A C 58432
 MENO N 59171
 MERCER J F *58794
 MERCHANT S R 58258
 MERRITT J H JR *58795
 MERTES K J *58796
 MESHENKON T 58924
 MESTRE A 59184, *59402

MOSS G

METTLER P 58553
 METZLER A J *59632
 MEYER J W *58150, *58151
 MEYER O 59514, 59515
 MEYERS A C 58582
 MEYERS R A *58797, 59511, *59633
 MICHAELIS K *58798
 MICHALEK R *58799
 MICHEL A 58548
 MICHELFELDER S *58800, 59157
 MILES D L *58801
 MILKINS E E *58802, 59206
 MILLER E M *58803
 MILLER J F 58177, 59082
 MILLER J P 59031
 MILLIMAN G E 58641
 MILLS J *58804
 MILLS R A *58805
 MILSTEIN D 58895
 MINET R G *59403
 MINJOLLE L 58740
 MIKOVIC S *58806
 MIQUEL J 58393
 MIRSKY W 58752
 MISHIMI F *58152
 MISKIEWICZ L A *58807
 MITCHELL D *59585
 MITCHELL E R 59671
 MITCHELL W J *58808
 MITSUI R 58500
 MITSUI T 59483
 MITSUYAMA M *58809
 MIURA M 58613, 58614
 MIWA K 58840
 MIWA N 59259
 MIYAHARA K *58810
 MIYAHARA T 59460
 MIYAJI Y 59204
 MIYAJIMA H *58811
 MIYAKI K *58812, 59231
 MIYAMOTO M *58813
 MIYAMOTO T *58814
 MIYAZAKI K 58643, 58687, 58992
 MIZOGUCHI T 59411
 MIZUGUCHI M *58815
 MIZUNO S 58851
 MIZUSHIMA T 59132
 MLODZINSKI B *58816
 MOCKRIDGE P C *58153
 MODER H 59214
 MODERSITZKI W *59404
 MOELLENKAMP F W 58314
 MOHR C M 58728
 MOHTADI M 58449, 58450
 MOKHNATKIN R A 58226
 MOKROTOVAROVA G N 58924
 MOLAYEM B 58936
 MOLINARI L F 58576
 MONDT J R *58817, *58818
 MONOSTORY F P 58738
 MONTAGNA A A *58819
 MONTGOMERY T L *58820
 MOORE G E 59619
 MOORES C W *58821
 MORAN G *58822
 MORIO 58592
 MORITA M *58823, *58824, 59002
 MORITA T *58154, 59573
 MORITA Y 59120
 MORIYAMA A *59634
 MORRALL J W *58825
 MORRIS R B 59024
 MORRIS W E *59635
 MORTON D W *58826
 MORTSTEDT S E *59677, *59678, *59679
 MOSHKOVICH A B 59051
 MOSS G *58827

MOSS P H 59245
 MOTE L B 58353
 MOTIN G I 58492
 MOYES A J *59586
 MOZES M S *58828
 MOZZON D 59509
 MUELLER J H *58829
 MUENK R *58830
 MUERMANN H *58155, *58831, *58832
 MUIR A J *58833
 MUKHINA T N 58695
 MULLER H J 58981
 MUNAKATA E 58834, *58834
 MURAI I *58835
 MURAKAMI Y *58836
 MURASE S 58684
 MURATA M 58410
 MUROI A *58837
 MURTHY K S 58412, *59405
 MUSICK J K *58838
 MYCOCK J C 58788
 MYERS J G 58785

N

NACHMAN J F 58362
 NACK H 58177, 59082
 NAGAI A *58839
 NAGAI M *58840
 NAGAI T *58841, 59132
 NAGAMATSU K *58842
 NAGAO J 59481
 NAGAOKA S 59105
 NAGATA K *58843
 NAGUMO S I 59406
 NAHAS N C *58844
 NAITO K 59573
 NAKADA M 58686, 58758, *58845
 NAKAGAWA T 58851
 NAKAGUCHI G M *58846
 NAKAHARA K 58529
 NAKAI M 59129
 NAKAI S 59104
 NAKAJIMA Y *58847, *58848, *59406, *59587
 NAKAMOTO T *58849
 NAKAMURA H *58850
 NAKAMURA K *59407
 NAKAMURA S 58908
 NAKAMURA T *58851, *58852, *59408, 59543
 NAKANO M 59439, 59454
 NAKANO N 59571
 NAKAO M 58989
 NAKASE K 58224
 NAKAYAMA M *58156
 NAMBU S 58774
 NAMIKI T 58655
 NANNEN L W *58157
 NASHAN G *58853
 NASSENSTEIN G *59636
 NASUNO A *58854
 NEBGEN W H *58855
 NEDEA E *58856
 NEELY W C *58857
 NEGORO M 59548
 NEIDHARD H 59017
 NEKERVIS W F *58858
 NELKEN H H *58859
 NELSON E E 58771
 NELSON G V *58860
 NELSON W 59580
 NEMOTO I 59625
 NESTAAS I *58861
 NESTEROV P M *58862, *58863
 NEWCOMBE G M *59588

NEWIRTH R 59024
 NEWMAN J *58864
 NICHOLAS D M *58158
 NICHOLS G B *58865, 59414
 NICKERSON R D *59699
 NIEBYLSKI L M *59409
 NIEHAUS C F *59637
 NIEPOTH G W 58801
 NIESSEN W R *58866
 NIIMI I 58320
 NIYAMA H 59338
 NIIZANE K 58459
 NIKITIN Y Y 59568
 NIKOLINA G N 58195
 NIKULIN N Y 59193
 NILAN R E 58414
 NINOMIYA M 58899
 NINOMIYA N 58780, *58867
 NISHIMOTO T 58556
 NISHIMOTO Y *58868
 NISHIMURA R 59125
 NISHINO H 58867
 NISHINOMIYA T *58869, 59240
 NISHIOKA N 58152
 NISHIYAMA O *59410
 NISHIYAMA R 59132
 NISHIZAWA T *58870
 NITTA Y 59043
 NIWA S 59232
 NOBE K 58250, 58257
 NODA F 58320
 NOGASHI D R 59086
 NOGUCHI M 59160
 NOHIRA H *58871, *58872, *58873, *58874
 NOJIRI H *58159
 NOKI S *59411
 NOLL K E *58875
 NOMURA H 59125
 NOMURA T *58876
 NONGBRI G 59517
 NORDSTROM B 59540
 NORIMATSU H 58409
 NORRIS W B 58820
 NORTON R 58315
 NOSKOVA N I 59112
 NOSTITZ WALLWITZ R V *58877
 NOTTRODT A *58878
 NOVAKOVICH M *59412
 NOVIKOV A I *58879
 NOWACK G P 58630
 NOZAWA M 59237
 NUMA JAMI K *58880
 NUTTER D E *58881

O

O DONNELL J J 58330
 O HARA M J *58882
 O MEARA D M 58912
 O NEILL E P *58160, 58659, *58883
 OBARA O *58884
 OBERDORFER P E *58885
 OBR J *58886
 OBRZUT J J *59413
 OCHI H 59542
 ODA M 58681, 58682, 58683
 ODA Y 58892
 ODELLO R 59304
 OESTREICH H *58887
 OGAWA H *58888
 OGLESBY S JR 58496, *59414
 OGURIT 58848
 OHARA T 58526
 OHHATA T 58526
 OHIRA T 59255
 OHKUBO A 58889

OHNISHI S 59132
 OHR K H 59214
 OHTANI J *58889
 OHYA K *58890
 OHYAMA N 58869, 59240
 OI A 58908
 OIESTAD A *58891
 OIWA K 58897, 58898
 OKAMOTO H *58892
 OKATSU Y 58906
 OKI H 59148
 OKI M 59259
 OKITSU K *58893
 OKLEJAS E JR 58894
 OKLEJAS R A *58894
 OKUBO A 58812
 OKUDA A S 58121
 OKUYAMA T 58880
 OLECK S M 58207, *58895
 OLENIK T J *59415
 OLIVER R G *58896
 OMORI N 58460, *58897, *58898
 OMORIT *58899
 ONI L A *58900
 ONNEN J H *58901, *58902
 ONUFER G R *58903
 OISHI M 58839
 OOKAZU Y 58905
 OPPOLD J A *58904
 ORTH K H *59534
 OSA T *58905, *58906
 OSHIBA T *59416
 OSHIKIRI K 58814
 OSHIMA S 58671
 OSHIMA T *58907
 OSHINSKI C C 58240
 OSTERHOLM R J 58631
 OSTOJIC N 58300
 OTANI H 59542
 OUCHI H *58908
 OVARO J C 58464
 OVER C E *58909
 OVERY J *58910
 OXLEY J H 58177, 59082
 OYAMA Y *58911

P

PACCIONE J D *58912
 PACHAIYAPPAN V 59036, 59037
 PADDOCK R E 58267
 PAINTER O K 58754
 PALUMBO F P 59062
 PAN P T *58913
 PANAK B 58987
 PANDOLFI L 59383
 PANGBORN J B 59038
 PANNEERSELVAM K N 59037
 PANOV V N 59112
 PANZER J *58914
 PAPADATOS K *58915
 PARASKOS J A 58357
 PAREKH R *58916
 PARKER A J JR 59355
 PARKER K R *58917, 59561
 PATCHETT R J *58918
 PATEL J A 58707
 PATEL N R *59535
 PATTON J D *58919, 59433
 PAUL C 58740
 PAULSON C A J 58938, *59417
 PAWLEK F 59693
 PAYTON R N *58920
 PAZIN L M *59418
 PEACOS M M 58282
 PEACY J *58921

AUTHOR INDEX

PEARCE J K 58255
 PECQUEUR M *59589
 PEDERSEN L A 59383
 PEFLEY R K 58194
 PELECIER C 58264
 PELTON J M *59638
 PENGELLY A E S 59540
 PENGIDORE D A *58922
 PENNEY G W *58923
 PENQUITE C R 58980
 PENTECOST J L *59419
 PEREKUPKA I A *58924
 PEREVUZNIAK J 58670
 PERRUSSEL R E 58554
 PERSHING D W *59536
 PERSSON G A *58925
 PERSSON H A 58515
 PERVIER J W 59024
 PETAJISTO J 58545
 PETER B 59017
 PETERS W *59420
 PETERSEN H H *59421
 PETERSON A J 58565
 PETERSON C H 58659
 PETERSON M W *58926
 PETERSSON S A *58927
 PETHERBRIDGE R J S *58928
 PETROV V I 58502
 PEZZE J P 59091
 PFEFFERIE W C *58929
 PFEIFFER J B 59361, 59362
 PFENNINGER H *58161, *58930
 PFOUTZ B D *59422
 PHILIPPE A 58516
 PHILLIPS J H 59336
 PHILLIPS W K 59540
 PIKE D E *58931
 PILLARD M T *58932
 PILLER W *58933
 PINKERTON J D 59372
 PIROGOV Y I 58195
 FISCHINGER F *58162, *58934
 PISKIE 58711
 PIZZIMENTI F L 58589
 PLUMLEY A L 59510
 POE G G 59046
 POLACH W *58935
 POLEVOIR P *59590
 POLTORAK R L 59365, 59396
 PONDER T C JR 58122
 POPE M *58936
 PORADEK S V 59073
 PORTNOV D M 58226
 POSPISIL M 58987
 POSTMA P *58937
 POTTER B H 59337
 POTTER E C *58938, 59417
 POTTER H C 59474
 POVETKIN F F 59673
 POWELL H E *58939, *58940
 PRAHACS S 59615
 PRATT D C F *59703
 PRICE S J W 59509
 PRICIOTTA F *58941
 PRIEST G R *58942
 PRIFTI M 59533
 PRIGENT M 59102
 PRINCIOTTA F T 59341
 PROCTOR A E *58943
 PROKHOROV I A 59193
 PUGH J L *59423
 PURI R *59424
 PUTNAM A A 58356
 PUTNEY D H *58944
 PYTHOUD S *58945

Q

QADER S A *59537
 QUADER A A *59538
 QUARTULLIO J *58946
 QUIGG H T *58947
 QUINNE E J *58163

R

RABANT C 58917
 RAGUIN J 59323
 RAINS B A *59539
 RALEIGH C W *59425
 RAMAN A K S 59614
 RAMANIR V 59456
 RANSBURG E M *59702
 RAO A K *58948
 RAO P H *59426
 RAO S R N 58582
 RAPER A G *59540
 RAPP H *58949
 RASCH R *58950
 RASE H F *58951
 RASTOGI D C 58197
 RASTORGUEV V P 58965
 RAWLINGS G D *58952
 RAY F M *58953, *59427
 RAYFEL D O F *59591
 RAYNAL B *58954
 RECORD R G H *58955
 REED R D *58956, *58957, *58958
 REESE G D *58959
 REESE R G *58960
 REGEHR U *59428
 REH L 58290, *58961, *58962
 REHM F R *59684
 REID C L 59540
 REIDER S B 58737
 REIGEL S A 58321, 58322
 REIMANN H 58981
 REIQUAM H E *59429
 REITHER K *58164
 RENAULT P 58248, *58963, *58964, *59430, *59431
 REPIK A J 59319
 REPKO L L 59598
 REPREV N V 58900
 RESHIDOV I K *58965
 RESLER E L JR *58966
 REYNOLDS J P *58967
 REZNITSKI I G *59592
 RHOADES V W *59432
 RHODES W W 58629
 RICH R E *58968
 RIESCO A H 58582
 RIESTER H 58325
 RIGO H G *58969
 RILEY D E 58476
 RINKER T L *58970
 RITTMANNBERGER N 59214
 RIXMANN W *59664
 RIZAEV N U 59532
 ROBERTS G W *58971
 ROBINSON J V *58972
 ROBISON J R *58973
 ROBSON F L *58974
 RODEM M M 59498
 ROE E H *59433
 ROESER H *58975
 ROGERS K J 58269
 ROLL J L *59434
 ROMANKOV P G 58226
 ROMANTSCHUK H 58545
 ROSAR E C 58394

SAROFIM A F

ROSENBERG H S *58165
 ROSENBERG R E 59246
 ROSENBLUM W J *59665
 ROSENBLUND I T *58976
 ROSENWALD R H *58977
 ROSS F *58978
 ROSSENBECK M *59639
 ROSSI R C 58114
 ROSSOFF J 58114
 ROSTEK H A *58979
 ROTH J F *58980
 ROTHWELL F *59541
 ROTTMAYR F *58981
 ROUNDS G L *59435
 ROY A J 59426
 ROZANOVA A P 58695
 RUBINSSTEIN G N 59051
 RUDNICK S N 58145
 RUDOLPH M 58933
 RUEB F *58166, *58982
 RUFF C D 59053
 RUGGERIS *58983
 RUHL E *59593
 RUOHOLA T 58545
 RUTHERFORD A 59703
 RUTHERFORD J G 59369
 RYABOKOBYLENKO V I 58900
 RYAN J J *58984
 RYBAKOV A P 59112
 RYCHKOV V P *58985, 59193
 RYMARZ T M *58986
 RYSKA J *58987

S

SADOFEV S R 58777
 SADOVSKIY B F 59519
 SAINTSBURY J A *58988
 SAITO H *58989
 SAITO K 58526
 SAITO M *58167, *58990
 SAITO S 59106
 SAITO T *58991, *59594
 SAITO Y 58556, *59542, 59579
 SAKAE Y 59548
 SAKAI F 59571
 SAKAI H 58556
 SAKAI M 58876
 SAKAI T *58992, 59117, *59436
 SAKANAKA H 58851
 SAKANO T 59461
 SAKURABA K *58993
 SAKURADA A 59132
 SAKURAI G *59595
 SAKURAI H *58994
 SAKURAI Y *58995
 SALE B *58996
 SALEEM A 58153, 58173, *58997
 SALETA L *58168
 SALLADAY D G 58190
 SALONEN A 58545
 SALTZMAN R S 58295
 SAMPATH P 58988
 SANAIEV Y I 58965
 SANDER U *58998
 SANDERS J W *59437
 SANO H *58169, 58888, *59438
 SANO K 58698, 58908
 SANO T *59543
 SANTIAGO A *58999
 SANTIAGO E 58999
 SAPLINOV L K 58195
 SAPOZHNIKOV A A 58502
 SARGENT C L *59000
 SARNA M *59001
 SAROFIM A F 58728

SASA K

SASA K 58841
 SASAGAWA K 58154
 SASAKI Y *59002
 SASAOKA E 58645
 SATO H *58170
 SATO K *59439
 SATO M *59003
 SATO T 58778, *59004, 59460
 SATO Y 59231
 SATOMI Y 59132
 SATTERFIELD C N *59666
 SAVAGE J M C *59005
 SAVRAEV V P *59006
 SCARRITT F M SR *59007
 SCHAEFER H 58933
 SCHAFFRATH M *58171
 SCHALKE P 58116
 SCHEITLIN G E *59008
 SCHELTENA H 59583
 SCHENKEL W 58247
 SCHERENBERG H O *59009
 SCHERIAU R *59010
 SCHINMAN G B 59020
 SCHIRMER R M 58947
 SCHLADITZ H J *59011
 SCHLAMERSDORF J M *59012
 SCHLAUER J 58115, 58308
 SCHMID K E 59664
 SCHMID P *59013
 SCHMID W *59014
 SCHMIDT H G *59015
 SCHMIDT H W 58998
 SCHMIDT K W *59016
 SCHMIDT P *59017, *59018, *59019, *59440
 SCHMIDT P J 58675
 SCHMIDT T R *59020
 SCHNARZ R 58548
 SCHOECK V E *59021
 SCHOLL F *59441
 SCHOOF R J *59685
 SCHOUW A C *59640
 SCHRAG M P *58172, 58948
 SCHREIBER R J 59046
 SCHRETER R E *59544
 SCHREY F 58629, 59349, 59379
 SCHROEDER D L 58255
 SCHUETTE W L 59384
 SCHUETZ H *59022
 SCHUKOFF B 59497
 SCHULITZ C F 58706
 SCHUSTER R 58981
 SCHWAB H *59023
 SCHWARTE J 58636
 SCHWARTZ H E *59704
 SCHWARTZ R F 58958
 SCHWARTZ W A *59024
 SCHWARZ M *59025
 SCHWARZ O 58765
 SCOTT B E 59563
 SCOTT D 59305
 SCOTT D S *59026
 SCOTT M M 58909
 SCOTT M M JR *59027, *59442
 SEABORG G T *59686
 SEARL T D 58641
 SEBASTIAN F P *59443
 SECKAR J *59444
 SEEGALL M I 58362
 SEFTON V B *59596, 59630
 SEIDLITZ S *59445
 SEKIDO O 59238
 SEKIGUCHI K 58616
 SELIBER J *59028
 SELKER A P *59029, *59030
 SELLORS J JR 59050
 SELMAN G L 58191
 SELMECZI J G *59031

SENJO T 59171
 SENSENBAUGH J D 59381
 SENTET 58704
 SERCU C L *59641
 SERENKO A S 58650
 SERGEEV V I 59140
 SERGEEVNA S 58900
 SERGEYS F J *59032
 SERKOV A G 59658
 SERRUYS M *59033
 SETH R G *59034
 SEYMOUR J E *59035
 SHAH Y T 58158, 58819
 SHANK G G 58959
 SHANKLIN R V III *59446
 SHANMUGA SUNDARAM S *59036
 SHANMUGASUNDARAM S *59037
 SHANNON L J 58102, 58103, 58104, 58129, 58172, 58948
 SHAPOSHNIKOV Y K 59519
 SHARER J E *59038
 SHARKEY A G JR 59296
 SHAROV P M 59051
 SHAW A *59039
 SHAW R 59352
 SHEEHAN J D *58173
 SHEELY H R *59040
 SHEFFIELD E W 58703
 SHELSTAD K A *59447
 SHERIDAN J H *59041
 SHERRY H S 58895
 SHERSTOV V Y 59139
 SHEVALENKO I S *59597
 SHIBANO K *59042
 SHIBATA N 58500
 SHIBUYA A *59043
 SHIBUYA T *59044, *59045
 SHIELDS J J 59242
 SHIGETA K 58892
 SHIH C C 59633
 SHIKI Y 58989
 SHIKADA T 58458
 SHILOV V A 58206
 SHIMADA K 58556
 SHIMIZU A B *59046
 SHIMIZU M 59599
 SHIMONAKA M 58893
 SHINGAI S 58814
 SHINGO Y 58849
 SHINODA N 58110, 58230
 SHINZATO T *59047
 SHIPOV E I 59051
 SHIRAISHI M 58685
 SHIRAISHI Y 58229, 58231
 SHIROTO N *59048
 SHOKIN I N *59049
 SHRINER W *59642
 SHULAR H E *59050
 SHULTZ J L 59296
 SHURYGIN A P *59051
 SHUTLER N D *59052
 SHUTT E 58191
 SIBEUD J P *59053
 SIDONS R H 59540
 SIDORENKO O N 59140
 SIEBER J H 58457
 SIEG R P *59054
 SIEGERT L D *59448
 SIEPMANN R 58761
 SIEWERT R M *59055
 SIMKO A *59598
 SIMS C W *59056
 SINGH H *59057
 SIZOVA G M 59156
 SKERKO N N 58201
 SKINNER G F *59058
 SKOGLAND I *59059

AIR POLLUTION ABSTRACTS, JUNE 1976

SKVORTSOV A N 58879
 SLACK A V 59588
 SLAKEY P B *59060
 SLINKO M G 59592
 SLOUGH J W 59632
 SLUTSKAYA S M 58695
 SMISSEN C E V D *59643
 SMITH B R 58751
 SMITH D 59509
 SMITH E M 58866
 SMITH J R *59061
 SMITH J W *59062
 SMITH M A *59449
 SMITH M Y 58397
 SMITH W H *59063
 SMITH W L *59064
 SMITHSON H R *59065
 SMITHSON I K *59066
 SMITT L *59644
 SNOW R H *58174, *59067, *59450
 SNYDER C A *59068
 SNYDER R B *59069
 SODA N *59451
 SOHR R T *59070
 SOKOLOV V I 58479
 SOLA A *59071
 SOLEM E L *59072
 SOLINHAC J 58516
 SOLOMATIN V I *59073
 SOLTYS A *59545
 SOMEKH G S *59074
 SPAIN R G *59075
 SPAITE P W *59076
 SPECTOR M L *59452
 SPEECE A L 58265
 SPEKTOR A N *59546
 SPIELBERG D H *59077
 SPIEWAK I 59305
 SPIGT C L *59078
 SPILMAN O L 59146
 SPRIGG G 58802
 SPRINGER K J *59453
 SQUIRES A M *59079
 SQUIRES R 58425
 ST PIERRE C C 59509
 STADELMANN M *58175, *58176
 STAFFIN R *59080
 STAHL G *59081
 STAHRMAN R C *59547
 STALBERG S 58333
 STAMBAUGH E P *58177, *59082
 STAO K *59454
 STARBUCK H S *59083
 STARENCHENKO V G 58379
 STARK S B *59084
 STARKMAN E S *59455
 STATLER C W *58178
 STAUTZENBERGER A L *59085
 STEELHAMMER J C *59086
 STEFANKO R *59456
 STEIB M L 58582
 STEIN A 59704
 STEIN T R 58895
 STENZEL J *59087
 STEPHENS R E *59088
 STEPHENS R H 58728
 STERNER M F 58217
 STETTNER R J 58361
 STEWART E A *59089
 STEWART L L 59422
 STINE L O 59645
 STIPEK J W *59090
 STIRTON J A 59065
 STOCKER H L 58737
 STOECKEL A 58262, 58263
 STOEHR R A *59091
 STOENNER A *59092

AUTHOR INDEX

STOLFA F *59645
STOLOV M A 59558
STOLYARVO M M *59093
STOVER W A 58207
STRAITZ J F III *59094
STRAUSS H J *59095, *59096
STREET E P 59698
STRINDEHAG O *59097
STROGAL SCHIKOV B S 58483
STRUBLE R W *59098
STRUKL J S *59099, 59207
STRYKER J L 59319
STUMPP G *59100
SUBKLEW G 58449, 58450
SUDO F 59044, 59045
SUEISHI M 58409
SUGAI M 58154
SUGANO S *59101
SUGIER A *59102
SUGIMOTO T 59625
SUGIMURA T 58459
SUGITA S 59579
SUGIYAMA K 58704
SULLIVAN R E 58223
SULLIVAN T A *59457
SULTANOV M Y *59103
SUMIYOSHI M 59160
SUN C C 58659
SUTHERLAND M E 59217
SUWA Y *59599
SUYDAM C *59458
SUZUKAWA N *59104
SUZUKI G *59105
SUZUKI K 59647
SUZUKI M 58673, 58908, *59459
SUZUKI N 59483
SUZUKI S *59548
SUZUKI T 58698
SUZUKI Y *59106, *59107
SVACHA R E 59077
SVERDRUP E F 58659
SVRCEK W Y 58915
SWEARINGEN T R 59142
SWEET A 58713
SWICK R M *59108
SWIFT F W 58582
SWIFT P 59541
SWITTHENBANK J 59500
SZARAWARA J *59549
SZE M C 58750

T

TABASARAN O *59109
TACKETT L P 58287
TADOKORO A *59110
TADOKORO T *59111
TAGER S A *59112, 59162
TAIRA M 59174
TAKACS E A *59113
TAKACS P *59114
TAKAHASHI H 58906
TAKAHASHI K 59122, 59577
TAKAHASHI N 58868
TAKAHASHI T 58461, *59115, *59460, 59594
TAKAHASHI Y *58179, *59116
TAKAMURA A *59117
TAKANO T 59451
TAKASAKI S *59118
TAKASHIMA A *59119, *59461
TAKASHIMA R 58757
TAKAYASU M *59120
TAKEHARA Z 58646, 58647
TAKENOCHI R *59121
TAKEUCHI H 58672, *59122

TAKEUCHI S *59123
TAKEYAMA T 58410
TAM S S 58177, 59082
TAMAI H *59124
TAMASKOVICS N 58856
TAMURA T *59600
TAMURA Y 59104
TAMURA Z 59101
TANABE M 58154
TANAKA E *59125
TANAKA I *59126
TANAKA M 59595
TANAKA O 59252, 59253
TANAKA Y 59160
TANAZAWA Y *59127, *59128
TANGE S *59129
TANIGUCHI H 58684
TANIMOTO F 58892
TANTRAM A D S *59130
TAO T C *59131
TASHIRO K 59579
TASSICKER O J 58805
TATE K *59132
TATENO H *59133
TAYLOR B W 58688, 58689, 59386
TAYLOR J C *59134
TAYLOR W C 59510
TAYODA Y 59410
TEK M R *59135
TELLER A J *59136
TERADA H *59137
TERAI K 59104
TERAMOTO M *59138
TERANISHI H 59138
TEREBENIN A N *59139
TERRY J P 59086
TEVEROVSKIY B Z *59140
THEKDI A C 58547
THEOBALD H *59141
THEODORE L 58967, 59465
THIBAUT BRIAN P L 59452
THIEBAULT R *59691
THIELKE J F *59550
THIEN G 59497
THOMAS A 59395
THOMAS J L 58380
THOMAS T J 58356
THOMPSON J K 59312
THOMPSON S P *59142
THOMPSON W T 59142
THOMSON J C *59646
THORNBURGH W F *59143
THOSS J E 58735
THURSTON K W *59144
TICHY H 59564
TIETZ L 59208
TIGGELBECK D D *59145
TILLMAN R M *59146
TIMOFFEEVA TOMSKAYA 58900
TINKER W H *59147
TKAC R E 59080
TODA T *59148
TODA Y *59149
TOGAMI T *59150
TOHATA H 58107, *59151, *59647
TOHYAMA T 59556
TOKUMARU A 58870
TOKUMOTO T 59237
TOLKSDORF H J *59152
TOMINAGA H 58458
TOMISAKA Y 59459
TOMITA T *59153, 59250
TOMLINSON J G 58737
TOORN L J VAN DER *59154
TORO R F *59155
TOROPKINA G N 58642, *59156
TOROSIAN A *59462

VAUTAW R L

TORRENCE S L 59319
TOUSSAINT M *59157
TOWNLEY H *59158
TOYAMA J *59159
TOYAMA K 58537
TOYODA E *59160
TREINIES N *59161
TRETTER V J JR *59463
TRIMBLE L E *59464
TRIPUSHKIN R R 59051
TROTH D L 58223
TRUBITSYN L A *59162
TRUMAN A H *59163
TRY R W *59164
TSENG L H *59601
TSEUNG A C C 59130
TSEYTLIN M A *59165
TSONG HOW C 58582
TSUCHIDA T 59574
TSUCHIO B 59160
TSUJIMURA K *59166
TSUKABAYASHI K 58813
TSUKADA T 59255
TSUKAMOTO Y *59167
TSUN HSU Y 58730
TSUNETSUGU M 58840
TSUNEYOSHI K 58229
TSUNO T 58655
TSURUDO C 58778
TSURUTA H *59168
TSUTSUMI S *59602
TSUZUKI Y 58698
TUFFNELL G W 58133
TURECEK J L 59391
TURNER F G 59504
TURNER J F III *58180
TURNER W D 58582
TURNER W F *59169

U

UCHITANI H *59170
UCHIYAMA H *59171
UDELHOFEN J H 59207
UEDA L 59548
UEDA M 58712
UEDA S 59104, *59172
UEDA Y *59173
UMEHARA H *59174
UNO S 59577
UPCHURCH L E *59175
URBAN P 58977
URLAUB A *59176
USHIMARU Y 59436
USHIO H 58228
USHIO S *59177
USUI K *59178
USUI S 59406

V

VAGNER L 58987
VAN GINNEKEN A J J *59179
VAN HECK K H 58426
VAN VORST W 59345
VANCINI C A 58221
VARDE K S *59180
VARDI J 59614
VARGA J JR *58181, *58182, 58245
VARTANIAN R D *59181
VASAN S 59586
VASILEENKO K I *59182
VATAVUK W M *59465
VAUGHAN D J 59437
VAUTAW R L 59008

VEJVODA J

VEJVODA J *59466, *59467
 VELEGOL J L *59183
 VERDIER C *59184
 VERDOUW A J 58223
 VERKAMP F J 58361
 VEST E W *59185
 VEVANG G D 58528
 VICKERS V T *59186
 VIDT E J 58659
 VIGIL J S *59648
 VIIG C 59059
 VILLELLA T R *59187, *59188
 VIRKOLA N E *59189
 VISSER P J *59649
 VITS H *59190
 VLNATY J *59191
 VODNEV A D 59051
 VOELKER F C JR *59192
 VOELKER H 58975
 VOETTER H 59154
 VOGEL E M 59379
 VOGEL G J 59069
 VOGT W *59468
 VOLGIN B P 58985, *59193
 VOORHEIS T S *59194
 VOROB EVA V V 58695
 VORONOV S 58900
 VOSPER R R 59194
 VOYTKOVSKIY B F 59182
 VYDRA K 58961, 58962

W

WACKENHUTH E C *59551
 WADE W D *59195
 WAELTI H R 58175
 WAGENER K *59469
 WAGNER M H *59196
 WAGNER W 58981
 WAHL J 59017, *59197
 WAID D W *59470
 WAKABAYASHI C 58224
 WAKAIZUMI A *59198, *59199
 WALDHEIM M *59200
 WALKER W M *59471
 WALKOWICZ H J 58528
 WALL B I *59201
 WALL C J 58261
 WALLIS M E *59202
 WALLNER J P *59603
 WALLON D V 58414
 WALLS M A 58386
 WANKE S E 58439
 WARYCH J 58816
 WATABE A 58869
 WATANABE H 59694
 WATANABE K 59254
 WATANABE M 58839
 WATANABE S *59203
 WATANABE T *59204, *59205, *59472, *59473
 WATANABE Y 58870
 WATARIS 58685
 WATSON C H 58802
 WATSON H C *59206
 WATSON R W *59207
 WEANT G E 58148
 WEAVER R D *59208
 WEAVING J H *59209
 WECKESSER E 58290
 WEI J 59359
 WEIDENBACH G 58305, 58693, *59210
 WEIL K H 59400
 WEINECK H *59604
 WEINSTEIN N J 59155
 WELCH S 58239

WELTY A B JR *59211
 WEN C Y *59212
 WENDT C J JR *59680
 WENNER J G *59213
 WENZEL W 58449, 58450
 WERNER P *59214
 WERTHEIMER H P 59628
 WESSEL W *59215
 WESSENAUER G O *59687
 WEST A D 58857
 WESTLIN K L *59216
 WHEELER F J JR 59442
 WHEELER R N JR *59217
 WHELAN B 58270
 WHITE L C *59688
 WHITE L T *59605
 WHITE R J 59054
 WIEBE H A 58582
 WIEKEN R H *59474
 WIEMANN H J 59404
 WIESENER K *59650
 WIGG E E 59614
 WIGGER H 58402
 WILDE G 58290
 WILEY R F *59475, *59476
 WILKINS W E *59218
 WILLIAMS F W 58838
 WILLIAMS J E *58183
 WILLIAMS J S *59219
 WILMERS G 58979
 WILSON E L 58844
 WILSON G R 58357
 WILSON H H *59477
 WILSON J 59527
 WILSON J L 59395
 WILSON W I 59069
 WINKHAUS G 58290
 WINTER K 59469
 WINTERHALTER J *59220
 WISE H *59478
 WISLER M M 58267
 WIST A O 59331
 WITT K C *59221
 WITTLE J K 58265
 WIXSON B G *59222
 WOEBCKE H N *59223
 WOELK G 58506, 58507
 WOELKE M *59224
 WOERTZ B B 58430
 WOLF W *59696
 WOLFE R C *59225
 WOLFF U 58933
 WOLK R H 59517
 WONG M M 58127
 WONG S L *59226
 WOOD H P *59479
 WOODHOUSE G 59675
 WOODIE R M 59293
 WOODS R L *59552
 WORK G A 58266
 WRAY G C 58860
 WRIGHT G 59540
 WU S C 58250
 WUEBBENHORST H *59227
 WUENSCH H *59228
 WUNSCH A 58670
 WUTH W 59693
 WYCZALEK F A *59229
 WYSOCKI H 59696

Y

YADA K 59542
 YADA Y *59230
 YAGIS 58372, *59231
 YAJIMA M *59232

AIR POLLUTION ABSTRACTS, JUNE 1976

YAKHILEVICH F M 58492
 YAKIMOVICH V Y 59658
 YAKUSHIN E K 58502
 YAMADA A 59125
 YAMADA H *59233
 YAMADA K *59234
 YAMADA S 59044
 YAMADA T *59235, *59480
 YAMAGISHI K *59236, *59237
 YAMAGUCHI T 58849
 YAMAKI N 58908
 YAMAMICHI Y *59481
 YAMAMOTO H 58179, 59116
 YAMAMOTO K *59238
 YAMAMOTO M 58687, 58992
 YAMAMOTO N 58698
 YAMAMOTO T *59239
 YAMANAKA Y 59122
 YAMAOKA Y 59105
 YAMASHITA K 59459
 YAMASHITA Y 59579
 YAMAUCHI T *59240
 YAMAYA T 58681, 58682
 YANAGI M 58228
 YANAGIHARA S *59651
 YANAGISAWA K *59241
 YANG M Y *59482
 YANG W C 58659
 YANIK S J 58357
 YANKOV V 59334
 YANNONE R A *59242, *59243
 YASHUEV G K *59244
 YASUNAGA N 59104
 YAVORSKY P M 59296
 YEAKY E L *59245
 YIE G G *59246
 YOAKAM B G 58343
 YOKOTA K 58224
 YOKOTA N *59483
 YOKOYAMA A *58184
 YOKOYAMA M *59247
 YONEDA H 58610
 YONEVA T 59204
 YOSHIDA A *59248
 YOSHIDA E *59249
 YOSHIDA M *59250, 59574
 YOSHIKAWA T 59578
 YOSHIKOSHI H 59105
 YOSHIMURA T 59406
 YOSHINO M *59252, *59253
 YOSHIZAWA S 58646, 58647, *59254
 YOSHIZUMI K *59255
 YOUNG J E 59386
 YOUNG K W *59256
 YOUNG L C *59484
 YOUNG R A 59324
 YOUNG R N *59257
 YOUNG W L 59336
 YOUNGBLOOD S B 59046
 YU A T *59258
 YUE B K *59553
 YUGE H *59259
 YUNG S 58334
 YUNGHAHN R J *59606
 YUROVSKII A Z *59485

Z

ZABAIROVA R A 58188
 ZADA F K 58598, 58601, 58602, 58605, 58606
 ZANELLI S *59260
 ZAPASNY V V 59006
 ZAVERTKIN I P 58195
 ZAYTSEVA A V 59103
 ZENTGRAF K M 58531

AUTHOR INDEX

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ZHUCHENKO I P *59262
ZIMMER K O *59692
ZIMMERER J L 58312
ZIMMERMAN R P 58977
ZINK J S 58958
ZLOCHOWER I A 58158

ZLOCHOWER I A

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